New species and keys for *Cryptandra* and *Stenanthemum* (Rhamnaceae) in Western Australia

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Abstract

Rye, B.L. New species and keys for *Cryptandra* and *Stenanthemum* (Rhamnaceae) in Western Australia. *Nuytsia* 16(2): 325–382 (2007). A generic key for the Rhamnaceae of central and southern Western Australia and keys to Western Australian members of *Cryptandra* Sm. and *Stenanthemum* Reissek are given. Two taxa previously described as varieties are raised to the species level with the new combination *Cryptandra intermedia* (Rye) Rye and the new name *C. multispina* Rye. The new taxa *Cryptandra beverleyensis* Rye, *C. craigiae* Rye, *C. crispula* Rye, *C. dielsii* C.A. Gardner ex Rye, *C. exserta* Rye, *C. imbricata* Rye, *C. inconspicua* Rye, *C. pendula* Rye, *C. micrantha* Rye, *C. stellulata* Rye, *Stenanthemum bremerense* Rye, *S. pumilum* subsp. *majus* Rye, *S. radiatum* Rye and *S. yorkense* Rye are described. Lectotypes are selected for *Cryptandra connata* C.A. Gardner and for the base name of *Cryptandra* sect. *Wichurea* Benth. Some of the newly named taxa are illustrated, distribution maps are given for the south-western species of *Cryptandra* and new taxa in *Stenanthemum*, and the distribution patterns of the south-western genera are discussed in relation to their morphology. There is also a generic description for *Cryptandra*, and new data are given for a few of the previously described taxa in both genera.

Introduction

The family Rhamnaceae is well represented in Western Australian, with over 100 native species in about 16 genera. Publication of descriptions for five new Western Australian species belonging to tribe Pomaderreae has long been delayed because of doubts as to their generic placement. Recent molecular work (Kellermann *et al.* 2005) has indicated that three of these species should be included in *Cryptandra*, another in the recently described genus *Polianthion* K.R. Thiele (Kellermann *et al.* 2006) and the fifth new species in the new genus *Papistylus* Kellermann, Rye & K.R. Thiele. *Papistylus* and another new genus, *Serichonus* K.R. Thiele, are described in the accompanying paper by Kellermann *et al.* (2007). That paper also reduces the circumscription of the genus *Blackallia* C.A. Gardner.

Over the last ten years, new species of Western Australian Rhamnaceae have been discovered by botanical collectors at an average rate of about one per year, mostly as a result of flora surveys of mining leases and other economic sites. Newly discovered species of *Cryptandra* and *Stenanthemum* and other unnamed members of the two genera are described here, with notes updating the previously published information on a few other taxa. There are also distribution maps for the south-western

members of the genus *Cryptandra*, a generic description of *Cryptandra*, a key to the Western Australian species of *Cryptandra* and an updated version of the existing key of Rye (2001) to accommodate the new species and subspecies of *Stenanthemum*.

A key to the six genera occurring in the Northern Botanical Province of Western Australia, published in Rye (1997), is here complemented by a key to all genera of Rhamnaceae occurring in the remainder of Western Australia. These two regions have only two genera in common, *Ventilago* Gaertner of the tribe Ventilagineae, which is absent from southern Australia but occurs in both the Kimberley and Pilbara regions, and *Cryptandra* of the tribe Pomaderreae. The six northern genera are varied in terms of the tribes they represent but have only one or two species each in the Northern Botanical Province. In contrast, all but one of the southern species are from the tribe Pomaderreae, which has a pronounced concentration in the south-west. About 90% of the Western Australian species are endemic, and most of these occur in the South West Botanical Province as defined in Beard (1980).

The current paper completes a review of the Western Australian Rhamnaceae, being the last in a series of papers that began with Rye (1995a). Now that generic boundaries have been established for this group, the opportunity is taken here to briefly examine how the generic distribution patterns are related to morphology.

Distribution patterns in relation to morphology

Several correlations have been observed between the geographic distribution of Western Australian members of the Rhamnaceae and their morphology. Before examining these correlations, the main kinds of distribution patterns found among the genera of Pomaderreae are outlined. Maps showing the Western Australian part of the distributions of these genera are available in FloraBase (Western Australian Herbarium 1998–).

Cryptandra and *Stenanthemum* have similar distribution patterns, both being concentrated in the South West Botanical Province and South Western Interzone (SWBP and SWI) of Western Australia, but also with representatives in all other states of Australia and the Northern Territory. Both genera have a single representative in the Pilbara region, but only *Cryptandra* also occurs in the tropical north of Australia and *Stenanthemum* extends further inland.

A second kind of distribution pattern is shown by *Pomaderris* Labill. and *Spyridium* Fenzl, which are much better represented in south-eastern Australia than in Western Australia, especially *Pomaderris* which even extends to New Zealand. In Western Australia, both genera are largely restricted to areas along the south coast, although Basket Bush, *Spyridium globulosum* (Labill.) Benth., extends up the west coast to the Houtman Abrolhos Islands.

The fifth largest genus of the Pomaderreae, *Trymalium* Fenzl, is the only one that is relatively common in the extreme south-west of Western Australia. *Trymalium* is largely restricted to the SWBP and SWI and does not reach the northern and eastern extremities of the SWBP, although it does have one representative in South Australia.

All of the smaller genera of the Pomaderreae are endemic to the south-west of Western Australia except for *Polianthion* K.R. Thiele, which also has a representative from south-eastern Queensland.

Habit

Most members of the Rhamnaceae in the south-west are dwarf to medium-sized shrubs whereas those in the more tropical climates of the far north of the state (Kimberley region) are tall or scrambling shrubs or trees up to 25 m high. Within the genus *Cryptandra*, south-western species are usually 0.1–1.5 m high but the single species from the Kimberley region is up to 2.5 m high. *Alphitonia* Reissek ex Endl. is up to 20 m high in the Kimberley whereas the closely related genus *Granitites* from the south-west has a maximum height of 2 m. Other Kimberley genera have no close relatives in the south.

Among the south-western Rhamnaceae, tree habit is unknown except in the genus *Trymalium*, which has been recorded up to 9 m high in the highest rainfall zones in forested areas of the south-west. *Pomaderris* and *Spyridium* are small to large shrubs that reach a maximum height of about 5 m, while *Stenanthemum* and the small genera reach a maximum height of *c.* 1.5 m or very rarely 2 m.

Spinescence occurs in some of the south-western species of varied genera of Rhamnaceae, with the greatest number of spinescent species in the genus *Cryptandra*. Here, the spines are not related to a climbing habit as in some of the tropical Rhamnaceae. There is some tendency for spinescence to be associated with a rounded shrub habit, often with divaricate interlaced branching. Divaricate interlaced branching is particularly common in the area of the Eremaean bordering the northern part of the South West Botanical Province. In New Zealand this kind of habit is found in the Rhamnaceous genus *Discaria* Hook. (Tomlinson 1978) and it is considered to afford resistance to browsing by large flightless birds. In Australia, perhaps this very stiff compact habit provides some protection from over-grazing by marsupials, or perhaps it provides some physiological advantage in relation to the dryness of the environment.

Two very unusual types of habit within the south-western Rhamnaceae may be of taxonomic significance at the generic level. Adventitious roots occur in *Serichonus* K.R. Thiele, as described in Kellermann *et al.* (2007), and the only other recorded occurrence is in the unrelated species *Cryptandra mutila* (see below). *Stenanthemum sublineare* Rye, a species that is so anomalous in its disc morphology that its placement in *Stenanthemum* has appeared doubtful, seems to be unique in its markedly lignotuberous habit. Its above ground parts are exceptionally small and are commonly exceeded by a large lignotuber situated well below ground level.

Leaf morphology

A variety of modifications that conserve water are found in species of Rhamnaceae from the arid zone. Within each genus, differences between species in leaf morphology are often related to where they occur. One interesting overall trend among the south-western Australian Rhamnaceae is a tendency for leaves with very recurved margins to be more common in the humid areas and conduplicate leaves to be associated more often with drier environments.

Stenanthemum is the only genus to extend right into the centre of Australia. Nearly all *Stenanthemum* species, including all those from the arid zone, have conduplicate leaves with the undersurface very densely hairy; they are able to halve their surface area by closing to completely shield the glabrous or less densely hairy upper surface in times of environmental stress. The few species of *Stenanthemum* that have recurved margins to the leaves and the glabrous upper surface permanently exposed occur in the more humid parts of the generic range in the south-west.

Similarly, the new genus *Papistylus* comprises one species with conduplicate leaves in the northern sandplains of the SWBP and a second species, one with a recurved glabrous upper surface to its leaves, in a high rainfall zone on the Darling Range.

Trymalium has conduplicate hairy leaves on its most inland species, *Trymalium myrtillus* S. Moore, and has broad-leaved species with both surfaces exposed and the upper surface more or less glabrous in the humid extreme south-west. In the intermediate areas there are some species with recurved to revolute leaf margins and the upper surface glabrous.

Juvenile and mature leaves are generally similar in morphology in the south-western Rhamnaceae. However, in the tree species of *Trymalium* known as Karri Hazel, two distinct types of leaves are produced, the juvenile leaves broadly ovate to circular and with scattered long hairs on the upper surface, and the mature leaves narrowly ovate or ovate and more or less glabrous. The large broad lower leaves may maximise the absorption of light for this taxon as it starts out in the undergrowth of forests or in temporary forest clearings.

In *Cryptandra*, the leaves are never conduplicate. Most species have a permanently exposed glabrous upper leaf surface, and the glabrous to densely hairy lower surface is partially to fully hidden by recurved to revolute margins. Some members of the *Cryptandra arbutiflora* complex tend to have both surfaces of the leaves exposed; those taxa that occur in the far south-west have leaves that are glabrous on the undersurface, whereas taxa that occur in the surrounding lower rainfall zones mostly have the lower surface hairy. The few species of *Cryptandra* that extend into the arid zone apparently cope with the increased water stress by having very small leaves and/or the upper leaf surface stellate-hairy, or by retaining very few tightly clustered leaves during dry periods.

While there is some tendency for genera of the Rhamnaceae to be characterised either by conduplicate leaves or leaves with recurved to revolute margins, these leaf characters are generally more useful at the species level as most genera show considerable plasticity in leaf morphology. Stipule characters (as illustrated by Thiele 2007: table 1) are far more reliable indicators of generic differences as they seem little affected by the habitat adaptations that greatly affect leaf morphology.

Descriptions and keys

Holotypes for all the new taxa are lodged at PERTH. All descriptions and all the measurements given in the keys are based on dried material. The words "in outline" are used for descriptions involving two-dimensional terms for leaf shape when the recurved to revolute margins cause the lamina to be thick. For illustrations of some of the main diagnostic characters of the genera, such as the disc characters used in the descriptions and keys below, see Thiele (2007: table 1). Where conservation status is not mentioned in the descriptions below it is because those taxa have numerous populations over wide ranges and are therefore not considered to be at risk. Many of the new taxa have conservation priority; an explanation of the codes used for conservation status is given at the end of each *Nuytsia* volume.

The generic key covers all of Western Australia except for the Northern Botanical Province, also known as the Kimberley Region, for which a key to genera has already been published (Rye 1997). In the species keys distribution data are included to assist with identifications, but the probability that some taxa extend beyond their currently known ranges should be borne in mind.

Key to the genera of Rhamnaceae in central and southern Western Australia

1. Plants glabrous or with simple hairs. Fruit 7–50 mm long, either a long samara or a black 3-locular schizocarp with a thin mealy layer below the exocarp. Seeds uniformly coloured (base not darkened); aril absent or large and deeply coloured, not exceeding seed body
   2. Tree with pendulous branches and almost linear leaves, not spinescent. Anthers without a basal appendage. Fruit a samara, compressed, prominently winged, the seed without an aril. Occurring north of the tropic of Capricorn. (Tribe Ventilagineae)..... **Ventilago**
   2. Shrub with spinescent spreading branches and broad leaves. Anthers with a small basal appendage. Mature fruit black, not winged, with a thin mealy layer below the exocarp, the seed with a large, deeply coloured aril. Occurring on granite outcrops in the south-west. (Tribe not established)..... **Granitites**
1. Plants nearly always with stellate hairs, often also with simple hairs. Fruit 1.5–7 mm long, either a brown to dark grey 2–4-locular schizocarp or indehiscent, not winged, with no mealy layer. Seeds nearly always with a darkened base; aril very reduced to larger than the seed body, usually translucent. (Tribe Pomaderreae)
   3. Stipules shortly connate at the base to the outside of the petiole or at least appearing to meet at base on a prominent node, free elsewhere. Leaves with recurved margins often obscuring the undersurface, the petiole glabrous (except in a few northern spp.). Floral tube with a free part extended shortly to far beyond the level of the disc; disc densely stellate-hairy in nearly all species..... **Cryptandra**
   3. Stipules either free and lateral or connate between the petiole and axis. Leaves rarely as above, often conduplicate or with petiole hairy. Floral tube and disc differing from above choice in one or more of the following: floral tube not or scarcely extended above disc; disc absent or glabrous, lining the tube or located near summit of tube
      4. Fresh flowers with petals absent or separated from the anther (although sometimes appearing to enclose the anther in dried material). Style 3-branched at apex. Fruitlets with a membranous or chartaceous basal window though which the seed is shed.
         5. Leaves opposite. Involucral bracts large, enclosing a dense pendulous head-like cluster of flowers. Flowers mostly 4-merous ..... **Siegfrieda**
         5. Leaves alternate or clustered. Involucral bracts shorter than flowers and usually inconspicuous at base of pedicels. Flowers 5-merous ..... **Pomaderris**
      4. Fresh flowers with petals with a hooded or clasping lamina enclosing the anther, rarely petals absent in *Polianthion* but then style 2-lobed. Style 2- or 3-lobed at apex. Fruitlets either indehiscent or longitudinally dehiscent, without a basal window
         6. Flowers either with anther-clasping petals or with a thick disc adnate to floral tube above the ovary. Fruitlets indehiscent, membranous, chartaceous or crustaceous, if crustaceous then minutely reticulate-pitted to prominently rugose-patterned on the inside or on all surfaces. Aril very reduced, saucer-shaped

7. Flowers sessile or subsessile in dense heads. Petals hooded. Disc adnate to floral tube directly above or separated from ovary. Fruitlets off-white, chartaceous to membranous and without any obvious patterning ..... **Spyridium**

7. Flowers pedicellate, usually in a long compound cyme, rarely umbel-like; pedicel (0.3)0.5–3 mm long. Petals anther-clasping. Disc horizontal, usually immediately surrounding ovary; floral tube fully adnate to ovary and disc (except in *T. urceolare*). Fruitlets brown and distinctly patterned on the inside or on all surfaces..... **Trymalium**

6. Flowers with hooded petals and disc level with ovary or lining tube thinly. Fruitlets longitudinally dehiscent, crustaceous, smooth. Aril medium-sized or large, thick, slightly to prominently 3-lobed

8. Plants inconspicuous, multi-stemmed at ground level from a large below-ground lignotuber; leaves with margins recurved to revolute. Disc thick, surrounding a smooth style..... **Stenanthemum sublineare**

8. Plants small to large shrubs with a single-stemmed or multi-branched base, not lignotuberous; leaves conduplicate in most species, if with margins recurved then disc lining the floral tube or style papillose

9. Disc absent or lining the floral tube. Fruit inferior, more or less subsessile. Seeds usually mottled above their darkened base..... **Stenanthemum**

9. Disc annular (often undulate at first), at junction of free part of floral tube and ovary. Fruit superior to largely inferior, more or less sessile to long-pedicellate. Seeds uniformly coloured above their darkened base

10. Stipules free and well separated, sometimes caducous. Leaves densely stellate-hairy on both surfaces (also with longer simple hairs on one or both surfaces). Floral tube (in flower) spreading, the free part less than 1 mm long and shorter than to scarcely exceeding adnate part. Ovary 2-locular; stigma 2-lobed..... **Polianthion**

10. Stipules connate at base or for up to half their length (between petiole and axil) and/or overlapping behind the petiole, persistent. Leaves with upper surface glabrous to moderately hairy. Floral tube (in flower) erect, the free part over 1 mm long and much longer than adnate part. Ovary 3-locular; stigma 3-lobed

11. Plants often with spinescent branchlets. Flowers glabrous,with broad base of floral tube bulging slightly downwards below the level of insertion of the tube. Style smooth. Fruit glabrous, superior or largely superior ..... **Blackallia**

11. Plants without spinescent branchlets. Flowers hairy, with all of the floral tube rising above the level of insertion of the tube. Style prominently papillose. Fruit hairy, half-inferior or largely inferior

12. Flowers in very lax cymes, long-pedicellate, with pedicel enlarging in fruit 2–3 times. Petal claw and stamen filaments shortly united at base ..... **Serichonus**

12. Flowers in head-like clusters, sessile or very shortly pedicellate, the pedicel not enlarging significantly in fruit. Petal claw free from stamen filament ..... **Papistylus**

Cryptandra Sm., *Trans. Linn. Soc. London, Bot.* 4: 217 (1798). *Type: Cryptandra ericifolia* = *Cryptandra ericoides* Sm., lectotype *fide* L.K.G. Pfeiffer, Nom. 1: 928 (1873).

Cryptandra Sm. subg. *Cryptandra* [automatically formed by description of subg. *Corisandra* Reissek *in* J.G.C. Lehmann, Pl. Preiss. 2: 285 (1848)] – *Cryptandra* Sm. sect. *Cryptandra* (see Bentham 1863: 438).

Cryptandra subg. *Corisandra* Reissek *in* J.G.C. Lehmann, Pl. Preiss. 2: 289 (1848). *Type: Cryptandra mutila* Nees ex Reissek.

Wichuraea Nees ex Reissek *in* J.G.C. Lehmann, Pl. Preiss. 2: 290 (1848) *nom. illeg. non* M. Roemer, Fam. Nat. Syn. Monogr. 4: 277 (1847) – *Cryptandra* sect. *Wichurea* Benth., Fl. Austral. 1: 443 (1863). *Type: Wichuraea arbutiflora* (Fenzl) Nees ex Reissek, lectotype here selected.

Shrubs dwarf to medium-sized, usually 0.1–1.5 m high, rarely up to 2.5 m high; indumentum usually present on young stems and at least part of the flowers, of simple and/or stellate hairs, with spinescent branchlets occurring in some species. *Stipules* borne on a prominent, usually glabrous base, shortly connate to the outside of petiole or at least meeting there, meeting but free to the inside of petiole, persistent. *Petioles* short or very short, glabrous in most species. *Leaf blades* usually narrow, entire, with recurved to revolute margins slightly to completely concealing the lower surface; upper surface glabrous in most species. *Flowers* usually each subtended by an involucre of 3–16 brown bracts, all or the lower flowers of each branchlet also subtended by a leaf and its stipules, often arranged in a spike-like or head-like cluster on each flowering branchlet. *Floral tube* adnate at base to ovary and with a long or short free tube extending above the ovary summit (but sometimes exceeded by the mature fruit), broad and sometimes bulging at the base. *Sepals* 5. *Petals* 5 (rarely absent), clawed; lamina cupped, enclosing an anther, often minutely papillose on outer surface. *Disc* inserted at the junction of ovary and free floral tube and somewhat to distinctly adnate to ovary, any free part closely appressed to ovary or fruit, undulate to prominently 5-lobed and fully or partially covering ovary in young flower, usually becoming annular with no lobes evident in fruit, stellate-hairy in almost all species. *Ovary* more or less ellipsoid, 1–3-locular (most species 3-locular). *Style* long, glabrous or occasionally with a few stellate hairs at base; stigmatic lobes or surfaces as many as ovary cells. *Fruit* a schizocarp (except in the 1-locular *C. micrantha*), largely inferior to largely superior, more or less ellipsoid or obovoid, indented between the rounded summits of the fruitlets (rarely of a single rounded fruitlet), partially to fully enclosed within the floral tube and bracts; fruitlets (except in *C. micrantha*) crustaceous, longitudinally dehiscent by a suture that extends the full length of the inner surface and over the summit of the fruitlet, with an open basal attachment forming a basal hole when the fruitlet is shed. *Seeds* compressed; body elliptic in outline, with a darkened base or rarely darkened throughout, usually fairly uniformly coloured above base or with a differently coloured border; aril in *C. connata* and *C. imbricata* very large, truncate and orange, but in most species moderately large, succulent, clear-translucent or white to pale ferruginous, with one inner (adaxial) and two lateral lobes, the lobes usually short.

Size and distribution. This is the second largest Australian genus of Rhamnaceae, with 55–60 or more species. It occurs mainly in southern mainland Australia, also with representatives in Tasmania, north-eastern Australia and the far north of the mainland, and with a single species from the Pilbara region, *C. monticola* Rye & Trudgen (see Rye & Trudgen 1995: fig. 1), but is absent from much of the arid zone. Currently 35 species are recognised in Western Australia, nearly all of them endemic, but *Cryptandra aridicola* extends slightly into South Australia and *C. myriantha* also occurs in South Australia and Victoria (J. Kellerman pers. comm.). *Cryptandra intratropica* W. Fitzg. is only known from the Kimberley region, but occurs so close to the border of the Northern Territory (Rye 1997: fig. 2C) that it may well extend outside Western Australia.

Lectotypification. A lectotype has already been chosen for *Cryptandra* but not for the synonymous generic name *Wichuraea* described by Reissek (1848). *Wichuraea* is illegitimate because this name had been used in the previous year for a genus of plants in a different family. Bentham (1863) legitimised the name when he reduced the group to a section of *Cryptandra* with a different spelling. Reissek (1848) listed two taxa, *Wichuraea arbutiflora* and *W. tubulosa*, now considered to be conspecific, being treated as two varieties of *Cryptandra arbutiflora*. The first of these, *W. arbutiflora*, is selected here as the lectotype for *Wichuraea*. This synonym of *Cryptandra arbutiflora* is therefore eastablished as the type species of *Cryptandra* sect. *Wichurea*.

Notes. Unlike most other genera of tribe Pomaderreae, *Cryptandra* usually does not have its flowers borne in cymose arrangements. Instead each flower is usually subtended by an involucre of up to 16 bracts. Two other unique characters in *Cryptandra* are the stipule type, as described above and in the generic key, and the presence of stellate hairs on the disc. All these characters are illustrated in Thiele (2007: table 1).

Three subgenera or sections have been recognised for *Cryptandra*, reflecting some of the great variation that occurs within this large genus, and several other species groups worthy of formal recognition (Thiele pers. comm.) have been suggested. A subgeneric classification would be useful, but more data on the genus throughout Australia are needed before this could be achieved. Ideally, molecular sampling of all or a large proportion of the species should be undertaken before any attempt is made to produce a new classification.

Most species of *Cryptandra* have sessile or subsessile flowers. Subgenus *Corisandra* was separated to accommodate a single species with pedicellate flowers and would, if still recognised, now contain three species. These three species include *Cryptandra pungens* Steud., which Reissek (1848) retained in the typical subgenus of *Cryptandra* [as subg. *Eucryptandra nom. illeg.*].

The last infrageneric group, Bentham's section *Wichurea*, has the lectotype *Cryptandra arbutiflora* as discussed above and, if it were to be reinstated, would need to include all of the *C. arbutiflora* complex. This group is somewhat atypical in having the disc largely free from the ovary and very prominently lobed.

Three of the new species described below are oddities in one way or another, as discussed under the individual species, and inclusion of them within *Cryptandra* has resulted in an expansion of the characters accepted in the generic description above. For example, the 1-locular character state has been added for the ovary and fruit.

Key to Western Australian species and infraspecific taxa of *Cryptandra*

1. Flowers shortly to obviously pedicellate, in an umbel-like cluster; pedicel 0.4–3 mm long, surrounded by 2–4 bracts

2. Leaves hairy on both surfaces of the blade and on petiole. Flowers with a hairy floral tube and 2-lobed stigma. (Kimberley region) ..... **C. intratropica**

2. Leaves glabrous on upper surface of blade and on petiole. Flowers differing from above choice in either being glabrous or having a 3-lobed stigma or both

3. Floral tube glabrous. Ovary and fruit 2- or less commonly 3-locular. Occurring mostly on coastal limestone. (Dirk Hartog Is. to Rockingham)..... **19. C. mutila**

3. Floral tube hairy. Ovary and fruit 3-locular. Occurring mostly inland
   4. Branchlets not spinescent. Pedicels short and tending to be hidden. Disc glabrous. (Dumbleyung area to Fitzgerald River)..... **16. C. inconspicua**
   4. Branchlets spinescent. Pedicels long and obvious. Disc hairy. (Geraldton area to Cape Arid National Park)..... **C. pungens**

1. Flowers sessile or subsessile (pedicel less than 0.3 mm long), solitary or in a head-like cluster, with the base of the floral tube enclosed by (3)5–16 imbricate bracts
   5. Stigma entire (with a single stigmatic surface) or 2-lobed. Fruit 1- or 2-locular
      6. Sepals 0.6–0.8 mm long. Stigma entire. Ovary 1-locular. Fruit apparently indehiscent, with a flexible wall. (Canna to Wongan Hills to Boorabbin) ...**17. C. micrantha**
      6. Sepals 0.9–1.3 mm long. Stigma with 2 small but distinct lobes. Ovary 2-locular. Fruit a schizocarp, crustaceous.
         7. Flowers with a short and fairly uniform indumentum on outside of floral tube and sepals. Fruit rather densely stellate-hairy on inferior part. (Wallaroo to Queen Victoria Spring Nature Reserve to Clyde Hill).....**C. distigma**
         7. Flowers with long dense indumentum on sepals and much less hairy or glabrous below. Fruit glabrous or with a few stellate hairs on inferior part. (Cooloomia Nature Reserve to Fitzgerald River to Boorabbin to Truslove).....**C. spyridioides**
   5. Stigma 3-lobed or with 3 lateral stigmatic surfaces. Fruit 3-locular
      8. Disc surrounding and spreading horizontally away from base of ovary in young flower, adnate or appressed to base of floral tube. Fruit prominently beaked, 6–7 mm long including apical beak. Seed uniformly coloured; aril very large, truncate, brightly coloured
         9. Bracts largely glabrous outside. Flowers glabrous outside except for the apex of the sepals. (Mount Magnet area to Kalgoorlie) ..... **11. C. connata**
         9. Bracts hairy outside. Flowers hairy outside. (Toolonga Nature Reserve to Lake Moore).....**12. C. imbricata**
      8. Disc partially to fully obscuring ovary in young flower, adnate or appressed to ovary. Fruit not beaked, 2–5 mm long; apex rounded and indented. Seed darkened at base; aril small to moderately large, usually distinctly 3-lobed, pale or colourless
         10. Young stems with a matted indumentum of long very fine hairs, the individual hairs too tangled for their type (whether simple or stellate) to be readily determined
            11. Floral tube (in flower) 1.5–2 mm long, enclosed in *c.* 3 bracts (not including the involucral bracts surrounding the flower head); free part of tube 0.8–1 mm long. Style glabrous, papillose. (Manmanning to Varley) ... **4. C. dielsii**
            11. Floral tube (in flower) either less than 1.2 mm long or enclosed in an involucre of 8–16 bracts. Style glabrous or hairy, not papillose
               12. Bracts 3–8 per flower. Floral tube (in flower) 0.7–1.1 mm long; free part of tube 0.4–0.7 mm long
                  13. Leaves mostly appearing sessile, the petiole 0.1–0.3 mm long and usually hidden within the stipule sheath. Sepals hairy throughout or towards apex, usually with a tuft of hairs protruding from the apex

14. Flowers with largest hairs 0.4–0.8 mm long, the upper floral tube subglabrous in contrast with the very densely hairy sepals. (Tammin to Lake King area)..... **C. polyclada** subsp. **polyclada**

14. Flowers with largest hairs 0.2–0.3 mm long, the upper floral tube and sepals both densely hairy. (Boorabbin area)..... **C. polyclada** subsp. **aequabilis**

13. Leaves distinctly but shortly petiolate, the petiole 0.3–0.6 mm long and exserted from the stipule sheath. Sepals glabrous throughout or with a sparse indumentum of simple appressed hairs towards the apex. (Mt Day to Lake Cowan to Ravensthorpe)..... **C. graniticola**

12. Bracts (8)9–16 per flower. Floral tube (in flower) 1.5–3.5 mm long; free part of tube 1–3 mm long

15. Sepals with a protruding apical tuft of hairs 1 mm or more long and at least 4 times longer than indumentum on remainder of sepal. Ovary and basal part of style with hairs *c.* 1 mm long. (Woodanilling to Frank Hann National Park)..... **9. C. leucopogon**

15. Sepals with hairs of uniform length or the apical hairs up to twice as long as indumentum on remainder of sepal, the apical hairs 0.1–0.5 mm long (except in *C. crispula*). Ovary and base of style with hairs 0.2–0.5 mm long

16. Leaves with apical point fairly erect. Free part of floral tube exserted well beyond involucre of bracts in flower (Hatter Hill to Norseman area)..... **15. C. exserta**

16. Leaves with apical point recurved. Free part of floral tube usually hidden within involucre of bracts in flower

17. Petals with a claw 0.5–0.8 mm long. Style 3.5–5 mm long. Occurring well inland, in Eremaean and eastern part of Interzone. (Anketell Station to Cosmo Newberry to Fraser Range, also SA) ..... **6. C. aridicola**

17. Petals with a claw 0.2–0.4 mm long. Style 0.8–3.5 mm long, if 3–3.5 mm long then restricted to South West Botanical Province and western part of Interzone

18. Leaves 0.8–2 mm long, rarely more. Sepals hairy throughout, sometimes with longer hairs concentrated towards apex but not forming well defined tufts and not exceeding 1 mm long

19. Sepals 2.7–3.7 mm long. Floral tube (in flower) 2.3–3.5 mm long, enclosed in 12–14 bracts; free part of tube 1.8–2.8 mm long. Style 2.5–3.5 mm long. (Manmanning to Dumbleyung to Ravensthorpe Range)..... **10a. C. minutifolia** subsp. **minutifolia**

19. Sepals 1.5–2.5 mm long. Floral tube (in flower) 1.5–2.3 mm long, enclosed in (8)9–12 bracts; free part of tube 1–1.5 mm long. Style 0.8–1.8(2.5) mm long. (Kulin to Barker Lake to Stirling Range area to Lort River area) ..... **10b. C. minutifolia** subsp. **brevistyla**

18. Leaves 2.5–4 mm long. Sepals usually either largely glabrous or with a well developed terminal tuft of hairs at least 1 mm long

20. Sepals often partially glabrous, with all hairs less than 0.5 mm long. (Goomalling to Beaufort River) ..... **7. C. beverleyensis**

20. Sepals very densely hairy, the apical hairs 1–1.5 mm long. (Coolgardie area to east of Norseman) ..... **8. C. crispula**

10. Young stems glabrous, papillose or with simple and/or stellate hairs distinguishable, the indumentum not matted but often dense

21. Free part of floral tube 0.3–0.7(0.8) mm long in flower (enlarging in fruit)

22. Flowers hairy outside on floral tube and sepals

23. Branchlets spinescent except on young plants. Free part of floral tube and sepals with simple but no stellate hairs. (Hopetoun area) ..... **13. C. craigiae**

23. Branchlets not spinescent. Free part of floral tube and sepals densely covered by a mixture of stellate and simple hairs

24. Petals usually absent, if present then readily shed and with the lamina reduced so that the claw tends to be as long as the lamina. (Nerren Nerren Station to Barker Lake) ..... **C. apetala** var. **apetala**

24. Petals present, fully enclosing an anther, the claw much shorter than the lamina

25. Young stems minutely stellate-hairy (in *C. apetala* sometimes also with larger simple hairs 0.2–0.4 mm long). Leaves minutely stellate- hairy or glabrous

26. Leaves with a fairly erect apex. Petals with a claw 0.2–0.4 mm long. (Wyalkatchem to Lake King) ..... **C. apetala** var. **anomala**

26. Leaves with a prominently recurved apex. Petals with a claw 0.1–0.15 mm long. (Boorabbin area to Fitzgerald River National Park to Cocklebiddy) ..... **C. recurva**

25. Young stems with appressed to spreading simple hairs 0.3–1 mm long. Leaves glabrous, with minute broad protrusions or with simple hairs up to 0.8 mm long. (Mingenew area to near Albany to Cocklebiddy) ..... **C. nutans**

22. Flowers glabrous outside throughout or in part (at least glabrous on free part of floral tube)

27. Sepals about as long as free part of floral tube, recurved

28. Spinescent branchlets absent or long (10–20 mm), with at least one node. Young stems usually hairy, with dark bark peeling in narrow strips and patches. (Dongara to Perth) ..... **C. scoparia**

28. Spinescent branchlets numerous, *c.* 6 mm long, nodeless or with only one node. Stems glabrous or glabrescent, with pale bark peeling in large strips. (Zuytdorp National Park to Marchagee) ..... **18. C. multispina**

27. Sepals (in flower) distinctly longer (usually two to four times) than free part of floral tube, usually spreading

29. Sepals hairy throughout or in distal half; simple hairs present. (Kalbarri area to Albany area to Cape Arid National Park, also South Australia and Victoria) ..... **C. myriantha**

29. Sepals glabrous or with a few scattered stellate hairs

30. Sepals at least four times as long as free part of floral tube. Fruit with coarse hairs over 0.5 mm long on summit. (Kalbarri area) ..... **C. glabriflora**

30. Sepals about twice as long as free part of floral tube. Fruit glabrous on superior part, except for the stellate-hairy disc. (Lake Muir area) ..... **1c. C. arbutiflora** var. **pygmaea**

21. Free part of floral tube (0.9)1–3.5 mm long in flower (enlarging in fruit)

31. Floral tube glabrous

32. Flowers in dense clusters. Sepals densely hairy towards apex. (Denmark area) ..... **C. congesta**

32. Flowers loosely arranged in leafy spike-like inflorescences. Sepals glabrous

33. Leaves densely stellate-hairy on lower surface, sometimes becoming glabrous with age. Peduncles sparsely to densely stellate-hairy

34. Young stems with scattered stellate hairs less than 0.1 mm long. (Morawa to Gingin to Beverley) ..... **5. C. stellulata**

34. Young stems with a dense or moderately dense indumentum of stellate hairs 0.2–0.3 mm long or with mainly simple hairs

35. Young stems with hairs mostly stellate. Floral tube 4–4.5 mm long. Fruit largely inferior. (Allanooka area, SE of Geraldton)..... **4. C. pendula**

35. Young stems with hairs mostly simple. Floral tube 1.7–3 mm long. Fruit *c.* half-inferior to largely superior. (N of Gairdner Range to Gingin and Stirling Range to Ravensthorpe area)..... **2. C. intermedia**

33. Young leaves glabrous on lower surface or with simple hairs along the midvein. Peduncles glabrous

36. Stem hairs recurved. Floral tube 1.2–1.8(2.3) mm long. Fruit usually with scattered large stellate hairs on superior part. (Kalbarri to Chapman River)..... **1b. C. arbutiflora** var. **borealis**

36. Stem hairs usually antrorse or patent. Floral tube usually either less than 1.5 mm long or 2.5–4.5 mm long. Fruit nearly always glabrous

37. Dwarf shrubs 0.05–0.25 m high. Floral tube *c.* 1 mm long. (Lake Muir area)..... **1c. C. arbutiflora** var. **pygmaea**

37. Shrubs 0.1–1 m high. Floral tube 1.2–4.5 mm long

38. Ovary largely superior in fruit, within a broad floral tube. Occurring inland of var. *tubulosa* on granite or laterite. (Gillingarra to Mount Barker and Jerramungup areas) ..... **1a. C. arbutiflora** var. **arbutiflora**

38. Ovary about half inferior in fruit, within a slender floral tube. Occurring on the west coast on limestone and in the south on granite. (Perth to Kent River)..... **1d. C. arbutiflora** var. **tubulosa**

31. Floral tube hairy

39. Leaves silvery pale green, densely hairy on blade and petiole. Occurring in the Pilbara region. (Hamersley Range to near Newman)..... **C. monticola**

39. Leaves green, glabrous or subglabrous on upper surface of blade and petiole. Distribution south-western

40. Stipules prominent, 4–6.5 mm long. Leaves with a prominent recurved apical point 0.2–0.5 mm long. Floral tube (in flower) 3–3.5 mm long. (Middle Ironcap to Hatter Hill)..... **C. intonsa**

40. Stipules small, 0.7–1.4 mm long. Leaves with a minute mucro or obtuse. Floral tube (in flower) 1.4–2.5 mm long

41. Free part of floral tube 1.5–2 mm long in flower. Style 2–2.5 mm long. (East Yuna Reserve to Canna)..... **3. C. nola**

41. Free part of floral tube 0.9–1.4 mm long in flower. Style 0.7–1.3 mm long. (Wialki area to Cape Riche to Gibson area) ..... **C. wilsonii**

The *Cryptandra arbutiflora* complex

Members of the *Cryptandra arbutiflora* complex extend from Kalbarri south-east to Hopetoun and to the extreme south-west corner of Western Australia, occurring in rocky locations with laterite, granite or limestone. This extremely variable group was previously considered to consist of two species, *C. nola* Rye and the polymorphic *C. arbutiflora*, for which five variants had been formally named as varieties. Two newly discovered species are named here as *Cryptandra pendula* and *C. stellulata*, bringing the total number of taxa recognised formally to eight. They mostly exhibit a pattern of geographic replacement but there are a few areas of overlap.

One of the varieties of *C. arbutiflora* is raised to the species level to become *C. intermedia*, differing from the four remaining varieties of *C. arbutiflora* in having stellate hairs on the stems, peduncles and undersurface of the leaves. Possibly, other varieties of *C. arbutiflora* should be recognised at least at the subspecific level but considerable variation within most of the varieties and the presence of intermediates has confused the taxonomy. There are also two new poorly known variants from the far south-east of the range of the *C. arbutiflora* complex that are now included within *C. intermedia*. One of these had previously been given the informal name *Cryptandra* sp. Ravensthorpe (*G.F. Craig* 6309).

Two members of the complex, *Cryptandra arbutiflora* var. *borealis* and *C. nola*, were included in a molecular analysis of a diverse selection of taxa from the tribe Pomaderreae (Kellermann *et al.* 2005). They formed a sub-clade nested well within the overall *Cryptandra* clade.

In addition to the descriptions of the newly recognised species in the complex, notes are included here for each of the varieties of *C. arbutiflora* to update the information published previously in Rye (1995b) and selected specimens, mainly from areas of range extension, are cited.

1. Cryptandra arbutiflora Fenzl *in* S.F.L. Endlicher, E. Fenzl, G. Bentham & H.W. Schott, Enum. Pl. Hueg. 26–27 (1837). – *Wichurea arbutiflora* (Fenzl) Nees ex Reissek *in* J.G.C. Lehmann, Pl. Preiss. 2: 2: 290 (1848). *Type:* Swan River [Western Australia, November–December 1833], *C.A. von Huegel* (*holo:* W).

Notes. This commonly collected species has two main areas of occurrence, one in the north separated by a large disjunction of over 300 km from a much larger southern area of occurrence, with three varieties recognised in the south and a fourth variety in the north. All of the varieties of *Cryptandra arbutiflora* have simple hairs but no stellate hairs on their young stems and are glabrous on the peduncles. They are also glabrous on the undersurface of the leaves or very rarely have a few simple hairs on the midrib.

1a. Cryptandra arbutiflora Fenzl var. **arbutiflora**

Young stems with a varied indumentum of coarse or fine, patent or spreading, straight or curved, invariably simple hairs, often with a mixture of minute and long hairs, the longer patent hairs 0.2–0.5 mm long. *Petioles* 0.5–1 mm long. *Leaf blades* 2.5–9 × 0.8–2.5 mm; lower surface glabrous, rarely with a few short simple hairs along midvein; upper surface usually glabrous, rarely with short or long simple patent hairs. *Peduncles* glabrous. *Floral tube* 2.5–5 mm long (not or scarcely enlarging in fruit); adnate part of tube absent or very short and hidden below basal bulge of free part so not contributing to the overall length of the tube; free part 2.5–5 mm long. *Sepals* 1.2–1.5 mm long. *Style* (1.5)2–4 mm long, usually reaching anthers or exserted, rarely shorter and included; stigmatic lobes usually scarcely extending laterally from apical part of style. *Fruit* 3/4 to fully superior, 2.5–2.8 mm long, superior part nearly always glabrous. *Seeds* 2–2.2 mm long; body 1.5–1.6 × 0.9–1.2 mm, uniformly orange-brown above a very dark base or with a differently coloured border; aril 0.8–0.9 mm long, often whitish, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: 6.7 miles [10.8 km] E of Carani, 30 Aug. 1971, *T.E.H. Aplin* 4883 (PERTH); 17 km WSW of Calingiri, Rica Erickson Reserve, 31°09'S, 116°18'E, 16 Sep. 2004, *R.K. Brummitt, A.S. George & E.G.H. Oliver* 21308 A (PERTH); Harper Rd–Balgarup Rd, 25 km SSW of Kojonup, 34°03'S, 117°05'E, 24 Oct. 1997 *C.M. Lewis* 306 (PERTH)

Selected atypical specimens examined (possible intermediates with var. *pygmaea*). WESTERN AUSTRALIA: Carbarup Rd near railway, Mount Barker, 34°38'S, 117°40'E, 10 Sep. 1983, *E.J. Croxford* 2553 (ALB, PERTH); riverside, off Woogenellup Rd, W of Kamballup, 34°33'S, 117°54'E, 12 Aug. 1997, *E.J. Croxford* 7791 (ALB, PERTH).

Distribution. Extends from Gillingarra south to Collie and south-east to Mount Barker and the Jerramungup area. (Figure 1B)

Notes. This variety overlaps considerably in its distribution with *Cryptandra intermedia* (Figure 1C), from which it is distinguished by its complete lack of stellate hairs on its young stems (all hairs being simple), the glabrous or almost glabrous undersurface of its leaves, and its glabrous peduncles. It usually also has longer styles. In the south-west, there are possible intermediates between *Cryptandra arbutiflora* var. *arbutiflora* and var. *pygmaea* (cited above) that are currently housed under var. *arbutiflora* but have yet to be examined in fruit. There may also be intermediates between var. *arbutiflora* and var. *tubulosa*. The paucity of fruiting material is a problem in distinguishing var. *arbutiflora* from var. *tubulosa* and var. *pygmaea* since the main distinguishing feature of var. *arbutiflora* is its largely to fully superior fruit, a character that is not available in flowering material.

Stem indumentum is particularly variable in *Cryptandra arbutiflora* var. *arbutiflora*. Many specimens have a fairly uniform indumentum of antrorsely curved hairs and a few specimens are similar but have retrorsely curved hairs; in both cases the leaves are glabrous on the upper surface and the stem hairs are often coarse. Many other specimens have patent or spreading straight hairs, often with a mixture of long and short simple hairs; in these specimens the leaves often also have simple hairs on their upper surface. However, there is no perfect separation of the specimens with these two main types of indumentum, which seem to show no correlation with other morphological characters.

The lengths of the floral tube and style are quite variable in *Cryptandra arbutiflora* var. *arbutiflora*, and one odd specimen was observed to have very short included styles *c.* 1.5 mm long.

1b. Cryptandra arbutiflora var. **borealis** Rye, *Nuytsia* 10: 260 (1995). *Type:* 17 km from Northampton on Port Gregory road, Western Australia, 8 August 1994, *S.J. Patrick* 1966 (*holo:* PERTH 04159810; *iso:* CANB).

Illustration. Rye (1995b: fig. 2A–C).

Young stems with coarse recurved or retrorse tubercles or minute simple hairs up to 0.1 mm long. *Petioles* 0.5–1.2 mm long. *Leaf blades* 4–14 × 0.6–2.5 mm; lower surface glabrous; upper surface glabrous. *Peduncles* glabrous. *Floral tube* 1.2–2.3 mm long (enlarging to 2–3 mm in fruit); adnate part of tube 0.2–0.4 mm long; free part 1–2 mm long. *Sepals* 1–1.8 mm long. *Style* 1.7–2.8 mm long, usually exserted; stigmatic lobes spreading, 0.1–0.2 mm long. *Fruit* 2/5 to half-inferior, 2.2–2.8 mm long, superior part often with scattered large stellate hairs. *Seeds* 1.7–2.1 mm long; body 1.3–1.6 × 0.7–1.2 mm, uniformly orange-brown above a very dark base; aril 0.6–0.8 mm long, ferruginous, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: at creek crossing on Scott Rd, 3.15 km N of Chapman East Rd, 28°38'S, 114°48'E, 20 Aug. 2003, *B.L. Rye* 238062 *& M.E. Trudgen* (PERTH); SE access Fairfax Drive, E bank of river, Chapman River Regional Park, 13 July 2001, *S. Vigilante* 302 (PERTH).

Distribution. Extends from Kalbarri south to Chapman River (Figure 1B).

Notes. This taxon occurs in the far north-west of the range of the *Cryptandra arbutiflora* complex. New collections of *C. arbutiflora* var. *borealis* have extended its range southwards somewhat and its range is surrounded to the south and east by those of *C. nola* and *C. pendula*.

Cryptandra arbutiflora var. *borealis* is less variable in its indumentum than the other varieties of *C. arbutiflora* and can generally be distinguished from them by the retrorse tubercles or minute hairs on its young stems. Other variants usually have longer hairs, which are usually patent or curved in an antrorse direction. A few specimens of var. *arbutiflora* are like var. *borealis* in having retrorse hairs but their hairs are longer than those of var. *borealis*. Stellate hairs are usually present on the ovary in var. *borealis* but are nearly always absent in the other varieties.

1c. Cryptandra arbutiflora var. **pygmaea** Rye, *Nuytsia* 10: 262 (1995). *Type:* Muir Highway, Western Australia, 16 November 1990, *A.R. Annels* 1291 (*holo:* PERTH 03128830).

Illustration. Rye (1995b: fig. 2I–M).

Young stems with a varied indumentum of coarse patent or spreading, straight or curved simple hairs up to 0.3 mm long. *Petioles* 0.4–0.8 mm long. *Leaf blades* 3–6 × 0.6–2 mm; lower surface glabrous; upper surface glabrous. *Peduncles* glabrous. *Floral tube* 1–1.5 mm long (enlarging to 1.5–2 mm in fruit); adnate part of tube *c.* 0.3 mm long. *Sepals* 1.4–1.5 mm long. *Style* 1.4–2 mm long, usually exserted; stigmatic lobes usually scarcely extending laterally from apical part of style. *Fruit* 1/5–1/3-inferior, 2–2.5 mm long, superior part glabrous. *Seeds* 1.7–1.8 mm long; body *c.* 1.3 × 0.7–0.8 mm, uniformly orange-brown above the dark base or with the border differently coloured; aril *c.* 0.6 mm long, whitish, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA [precise localities withheld]: Muir Highway, 15 Nov. 1990, *A.R. Annels* 1281 (PERTH); S of Rocky Gully, 9 Sep. 1995, *A.R. Annels* 5424 & *R.W. Hearn* (PERTH); Tonebridge, 5 Sep. 1995, *R.J. Cranfield* 10292 (PERTH); Galamup Nature Reserve, 23 Oct. 1997, *G.J. Keighery & N. Gibson* 2376 (PERTH).

Distribution. Extends from near Tonebridge south-west to near Nyamup and south-east to near Rocky Gully (Figure 1B).

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. This variety is recorded from at least six populations (two in nature reserves) over a range of *c.* 70 km, although attempts to relocate the oldest population near Nyamup have been unsuccessful; without that locality the known range is only *c.* 40 km.

Notes. Two of the new collections (*A.R. Annels* 1281 and *G.J. Keighery & N. Gibson* 2376) have mature seeds. One character previously noted as possibly aiding separation of this taxon from other varieties was the separation of the stellate-hairy disc from the adnate part of the floral tube in fruit; this is now known to occur sometimes in the other varieties and so is not considered to be an important character. Possible intermediate specimens between var. *pygmaea* and var. *arbutiflora* are listed under var. *arbutiflora*.

1d. Cryptandra arbutiflora var. **tubulosa** (Fenzl) Benth., Fl. Austral. 1, 444 (1863). – *Cryptandra tubulosa* Fenzl *in* S.F.L. Endlicher, E. Fenzl, G. Bentham & H.W. Schott, Enum. Pl. Hueg. 26 (1837). *Type:* "King George Sound" [probably actually collected at or near Perth, Western Australia, November–December 1833], *C.A. von Huegel* (*holo:* W).

For other synonyms see Rye (1995b: 263).

Illustration. Rye (1995b: fig. 2N–Q).

Young stems with an indumentum of coarse or fine, patent or spreading or antrorsely curved simple hairs up to 0.4 mm long, often with medium-sized curved hairs not varying much in length, sometimes with a mixture of minute and long patent hairs. *Petioles* 0.5–0.8 mm long. *Leaf blades* 2.5–7 × 0.8–1.5 mm; lower surface glabrous; upper surface glabrous or sometimes with simple patent hairs. *Peduncles* glabrous. *Floral tube* 3–4.5 mm long (not enlarging significantly in fruit); adnate part of tube less than 1 mm long. *Sepals* 1.2–1.5 mm long. *Style c.* 3.5 mm long, usually exserted; stigmatic lobes usually scarcely extending laterally from apical part of style. *Fruit c.* half-inferior, *c.* 2 mm long, superior part glabrous. *Seeds c.* 1.5 mm long; body *c.* 1.2 × 0.7 mm, medium brown with margin somewhat different from centre above a dark base; aril 0.5–0.6 mm long, whitish, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: Plot 5093, 11.5 km S of Rocky Gully, on Kent River, 20 Sep. 1993, *A.R. Annels* 3689 (PERTH); Kemerton Industrial Estate, S of Marriott Rd, 9 km SE of Binningup, 33°13'S, 115°44'E, 28 Sep. 1993, *B.J. Keighery & N. Gibson* 388 (PERTH); Donnelly Mill Rd, Yornup, 34°05'S, 116°04'E, 19 Aug. 1997, *S. May* 57 (PERTH).

Distribution. Recent collections of the taxon in the far south of the state are from granite habitats extending from the far south-west coast inland to near Bridgetown and extending east to Kent River. (Figure 1C)

Notes. Huegel's collections from the Swan River Colony were made in the vicinity of Perth between 17 November and 19 December 1833, and at King George Sound in early January 1834 (Endlicher *et al.* 1837). Some specimens labelled as coming from King George Sound must have been collected earlier from Perth because they are of taxa known only from the former region, for example *Astartea affinis* (Schauer) Rye (Rye 2006). *Cryptandra arbutiflora* var. *tubulosa* appears to be another example of this, as it used to occur at multiple locations on limestone on the coast and around the Swan River estuary, Perth, but is not known from King George Sound.

Fruit and seed measurements were taken from *N. Casson & D. Bright* SC13.2. More good fruiting material is needed for this variety. See also notes under var. *arbutiflora*.

2. Cryptandra intermedia (Rye) Rye, *comb. nov.*

Cryptandra arbutiflora var. *intermedia* Rye, *Nuytsia* 10: 260–262 (1995). *Type:* 2 km south-west of Jurien Bay turnoff from Brand Highway, 3.7 km west along track opposite Marchagee track, Western Australia, 2 July 1992, *R.J. Cranfield & P. Spencer* 8283 (*holo:* PERTH 02847515; *iso:* CANB).

Illustration. Rye (1995b: fig. 2D–H).

Shrubs usually 0.2–0.7 m high, commonly with spinescent branchlets 7–20 mm long. *Stipules* 0.8–1.4 mm long, attenuate to acuminate, glabrous. *Young stems* with a varied indumentum of coarse or fine patent or spreading hairs up to 0.3 mm long, often with a mixture of small stellate hairs and longer simple hairs or with both short and long simple hairs, sometimes mainly with hairs of only one kind; simple hairs either straight and patent or curved and antrorse; stellate hairs always present in at least some positions but less common than the simple hairs and often absent from large areas of the stems. *Petioles* 0.4–1.2 mm long, well exserted from stipules. *Leaf blades* more or less elliptic to linear in outline, 3–9 × 0.6–2 mm, with a recurved or erect mucro up to 0.3 mm long; lower surface usually largely concealed by the recurved to revolute margins, densely stellate-hairy, sometimes becoming glabrous with age; upper surface glabrous, tuberculate or with coarse or fine simple patent hairs. *Peduncles* densely stellate-hairy or rarely sparsely stellate-hairy. *Bracts c.* 8, broadly ovate to oblong-elliptic, the inner ones *c.* 1 mm long, obtuse, becoming torn. *Flowers* usually 2–10 per branchlet in a spike-like arrangement, white. *Floral tube* 1.5–3 mm long (enlarging to 2–4 mm in fruit); adnate part of tube *c.* 0.4 mm long; free part 1.2–2.8 mm long. *Sepals* 1.2–1.7 mm long, glabrous. *Petals c.* 0.8 mm long; claw 0.1–0.2 mm long. *Disc* with stellate hairs *c.* 0.2 mm long. *Ovary* 3-locular; summit usually with few stellate hairs *c.* 0.3 mm long, sometimes more densely stellate-hairy or glabrous. *Style* usually 1–2.4 mm long, below or reaching the level of the anthers, rarely up to 3.5 mm long and well exserted; stigmatic lobes usually scarcely extending laterally from apical part of style. *Fruit* 1/5- to half-inferior, 2.2–2.6 mm long, superior part stellate-hairy or sometimes glabrous. *Seeds* 1.5–2.1 mm long; body 1.2–1.5 × 0.6–0.8 mm, uniformly coloured above the dark base or with a differently coloured border; aril 0.5–0.6 mm long, white or pale-ferruginous, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: 2.3 km S of South Coast Highway on Hopetoun–Ravensthorpe road opposite entrance of old copper smelter, 8 Feb. 2005, *G.F. Craig* 6309 (PERTH); at corner of road (Formby) to Gnowangerup and Chester Pass Rd, Mt Trio, Stirling Range, 7 July 1985, *E.J. Croxford* 4281 (PERTH); Northam, Oct. 1900, *Gregory* (PERTH); York, 3 Sep. 1905, *O.H. Sargent* 346 (PERTH).

Distribution. Extends from north of Gairdner Range south to Gingin and south-east to the Beverley area, apparently also occurring in the Stirling Range to Ravensthorpe area. New collections have only slightly extended the main range of *Cryptandra intermedia* but atypical specimens collected from over 250 km further south-east in the Stirling Range and near Ravensthorpe have increased the range of the whole *C. arbutiflora* complex. (Figure 1C)

Etymology. From the Latin words *inter* (between) and *medius* (middle). This member of the *Cryptandra arbutiflora* complex has a somewhat intermediate distribution in relation to those of the other members of the complex. It also has a somewhat intermediate morphology, particularly in its stem indumentum, which is very variable.

Affinities. Like *Cryptandra nola*, *C. pendula* and *C. stellulata*, *C. intermedia* is distinguished from all varieties of *C. arbutiflora* by its stellate-hairy rather than glabrous peduncles and by the hairy undersurface of its leaves. The four varieties of *C. arbutiflora* have only simple hairs on their stems whereas the other members of the *C. arbutiflora* complex have stellate hairs on the stems as well as, or instead of, simple hairs.

Of the other three species recognised, *Cryptandra stellulata* is the closest in morphology to *C. intermedia* but its stems differ in having a sparse covering of minute stellate hairs whereas *C. intermedia* has mainly simple hairs of a variety of sizes and its few stellate hairs are larger than those of *C. stellulata*. The simple hairs in *C. intermedia* are either straight and patent or curved towards the apex of the stem and may be all of the same size, or there may be a mixture of long and minute hairs.

Unlike *Cryptandra nola*, *C. pendula* and *C. stellulata*, *C. intermedia* has the stigmatic lobes very small and it often has a short style in relation to its anther height.

Notes. One of the new south-eastern collections (*E.J. Croxford* 4281) is from near Mt Trio in the Stirling Range while the rest are from near Ravensthorpe. The Stirling Range specimen has occasional very large stiff hairs on the upper surface of the leaf, a character also occasionally found in specimens from the main area of distribution of *Cryptandra intermedia*. The other specimens are from south of Ravensthorpe and have been allocated the informal name *Cryptandra* sp. Ravensthorpe (*G.F. Craig* 6309). They have short patent hairs covering the upper surface of the leaf, similar to the leaves of some specimens from the northern area. Despite their great isolation, all of the south-eastern specimens seem to fit easily within the wide range of variation in leaf indumentum already recorded for *Cryptandra intermedia*.

The Mt Trio specimen, which is not in fruit, differs from the northern specimens in its shorter floral tube and style. It shows little similarity to the Ravensthorpe specimens which have a long style. The *Cryptandra* sp. Ravensthorpe specimens have a larger seed than any of the fruiting specimens examined from the northern area. Whether this difference in seed size is significant remains to be determined. More collections are needed in the south-eastern region to determine what formal taxonomic status, if any, these new variants should have.

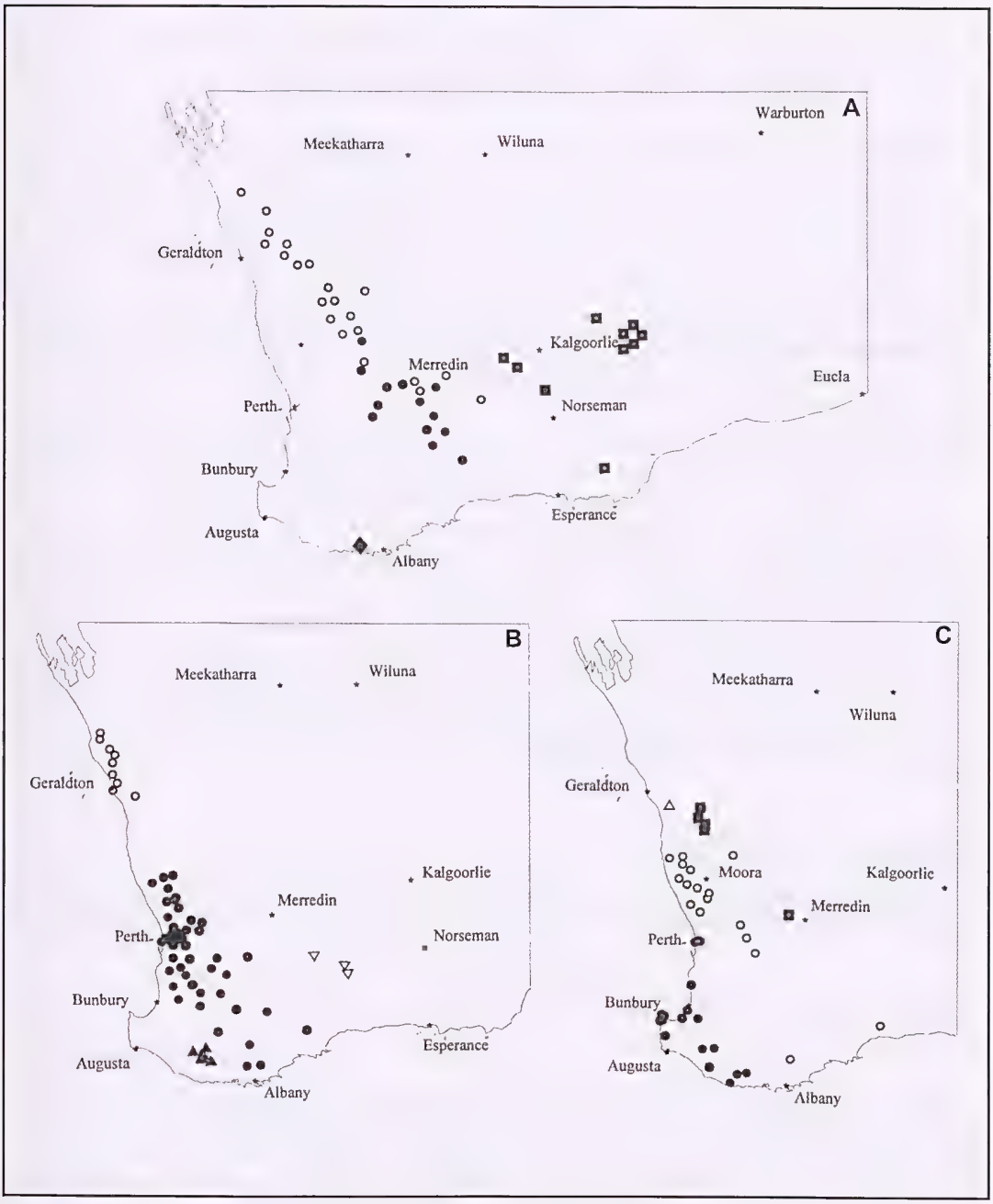

Figure 1. Geographic distributions. A – *Cryptandra apetala* Ewart & Jean White var. *apetala* ○, *C. apetala* var. *anomala* Rye ●, *C. congesta* Rye ♦ and *C. distigma* Rye ■; B – *Cryptandra arbutiflora* var. *arbutiflora* ●, *C. arbutiflora* var. *borealis* ○, *C. arbutiflora* var. *pygmaea* ▲ and *C. intonsa* Rye ▽ ; C – *Cryptandra arbutiflora* var. *tubulosa* ●, *C. intermedia* ○, *C. pendula* △ and *C. stellulata* ■ .

3. Cryptandra nola Rye, *Nuytsia* 10: 275–276 (1995). *Type:* 1.4 km east of railway crossing east of Mullewa, Western Australia, 6 August 1994, *S.J. Patrick* 1945 (*holo:* PERTH 04160169; *iso:* CANB, MEL).

Illustration. Rye (1995b: fig. 4J–M).

Description as given in Rye (1995b: 275–276) except for the following additions. *Leaves* 1.2–3.5 mm long, with antrorse simple hairs on the midvein of undersurface visible even when the margins are concealing the remainder of the leaf undersurface, which is densely minutely stellate-hairy. *Peduncles* densely stellate-hairy. *Style* 2–2.8 mm long, exserted, the base stellate-hairy; stigmatic lobes well developed. *Fruit c.* 2/3 superior, *c.* 3 mm long, superior part sparsely minutely stellate-hairy. *Seeds* not seen at maturity, the largest seen *c.* 2.4 mm long; body *c.* 2.1 × 1.2 mm, medium brown above a dark base; aril 0.5–0.6 mm long, whitish, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: Reserve No. 22125, located on Pintharuka Dam Rd, 10 Sep. 1993, *R.J. Colum* 4 (PERTH); Ogilvie East Rd, at bend in the road 6.6 km W of Horan Rd, 19 Aug. 2003, *B.L. Rye* 238039 *& M.E. Trudgen* (PERTH); Old Pinjar Rd, 4.5 km NE of start of road and 2.6 km from intersection with Docherty Rd, 9 Sep. 2003, *B.L. Rye* 239044 *& M.E. Trudgen* (PERTH); 2.5 km SW of Croot Rd on Canna North-East Rd, 9 Sep. 2003, *B.L. Rye* 239055 *& M.E. Trudgen* (PERTH).

Distribution. Extends from East Yuna Reserve south-east to Canna. (Figure 2A)

Conservation status. Previously this species had a conservation status of Priority Two. Recent collections have increased the number of known populations and it is now assessed as Priority Three.

4. Cryptandra pendula Rye, *sp. nov.*

Ramuli stellate-pilis; flores glabri, tubus 4–5 mm longi; ovarium triloculare; fructus magnopere inferiore.

Typus: Allanooka area [precise locality withheld], Western Australia, 3 Aug. 2005, *J. Else* 21 (*holo:* PERTH 07292627).

Shrubs c. 0.75 m high, no spinescent branchlets seen. *Young stems* densely stellate-hairy at first, apparently sometimes also with a few simple patent hairs; longest hairs 0.2–0.3 mm long. *Stipules* 0.8–1.3 mm long, acute to acuminate, glabrous. *Petioles* 0.7–1.1 mm long, well exserted from stipules. *Leaf blades* linear or almost linear in outline, 8–10 × 0.6–1.3 mm, with a recurved mucro 0.1–0.2 mm long; lower surface often concealed by the recurved to revolute margins, densely white stellate-hairy; upper surface smooth or tuberculate, glabrous. *Peduncles* densely stellate-hairy. *Bracts c.* 13, arising over a distance of *c.* 1 mm long, broadly ovate to oblong-elliptic, glabrous; the inner ones *c.* 1.4 mm long, obtuse, becoming torn and erose. *Flowers* commonly 5–15 per branchlet in a spike-like arrangement, pendulous, white. *Floral tube* 4–4.5 mm long (enlarging to 4–5 mm in fruit), glabrous; adnate part of tube hidden by bracts, *c.* 1 mm long; free part 3–3.5 mm long. *Sepals c.* 1.6 mm long, glabrous. *Petals c.* 1 mm long; claw *c.* 0.2 mm long. *Disc* with stellate hairs *c.* 0.3 mm long. *Ovary* 3-locular; summit

glabrous. *Style c.* 3 mm long, included, glabrous; stigmatic lobes scarcely extending laterally from apical part of style. *Fruit c.* 4/5-inferior, *c.* 2.6 mm long, glabrous except for the hairy disc. *Seeds* not seen at maturity, the largest *c.* 2.2 mm long, with a whitish 3-lobed aril *c.* 0.8 mm long.

Distribution and habitat. Known from a single locality in the Allanooka area, south-east of Geraldton. Recorded on an upper hill slope in lateritic gravel with several species of *Melaleuca* and occasional *Casuarina campestis* shrubs. (Figure 1C)

Flowering period. July to August.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. This recently discovered species is known from a single locality where it was described as being "occasional". As this population is in an area that has not been surveyed very thoroughly, it seems likely that further populations will be discovered.

Etymology. From the Latin word *pendulus* (drooping) as this species has pendulous flowers and fruits.

Affinities. As far as it is known so far, this species differs from its closest relatives, *C. arbutiflora*, *C. intermedia*, *C. nola* and *C. stellulata*, in its lack of spinescent branchlets, but more collections are needed to confirm that it is never spinescent. It differs from *C. nola* in its longer glabrous flowers and from *C. arbutiflora* in its dense stellate indumentum on the young stems and on the undersurface of the leaves. It is unusual in the genus as a whole in having the ovary largely inferior. Together with the largest-flowered specimens known for *C. arbutiflora* var. *tubulosa*, *C. pendula* has the longest flowers known for the genus in Western Australia, although some eastern Australian species have even longer flowers.

Notes. This new taxon, previously known as *Cryptandra* sp. Allanooka (*J. Else* 21), occurs south-east of Geraldton (Figure 1C) in an area where no other members of the *Cryptandra arbutiflora* complex have been recorded. Although *C. pendula* is known from only one specimen, its very distinctive flowers and fruits indicate that it should be recognised at the species level. Mature seeds are needed and the species needs to be surveyed to assess its conservation status.

5. Cryptandra stellulata Rye, *sp. nov.*

Cryptandrae nolae affinis sed floris glabrus et foliorum longioribus, magis glabrus differt.

Typus: Billeranga Hills Site M1C, 17 km W of Morawa, Western Australia, 20 August 1997, *F. Keast* M1C 253 (*holo:* PERTH 05037174).

Shrubs 0.3–1 m high, commonly with spinescent branchlets 6–12 mm long. *Young stems* stellate-hairy at first but hairs minute, usually less than 0.1 mm long, and often scattered, with no simple hairs present, becoming glabrous. *Stipules* 0.8–1 mm long, acute to acuminate, glabrous. *Petioles* 0.6–0.8 mm long, well exserted from stipules. *Leaf blades* narrowly oblong to linear in outline, 4–12 × 0.7–1.8 mm, with a recurved or erect mucro up to 0.3 mm long; lower surface usually concealed by

the recurved to revolute margins, densely or moderately densely stellate-hairy; upper surface smooth or with minute acute broad protrusions, glabrous. *Peduncles* densely stellate-hairy. *Bracts c.* 8, broadly ovate to oblong-elliptic, closely packed at base of floral tube and patent, the inner ones *c.* 1.5 mm long, obtuse, becoming torn and erose. *Flowers* usually 2–12 per branchlet in a spike-like arrangement, white. *Floral tube* 1.7–2.5 mm long (not seen in fruit); adnate part of tube short and hidden below bulging base of free part, so not contributing to length of tube. *Sepals* 1.3–1.5 mm long, glabrous. *Petals c.* 1 mm long; claw 0.1–0.2 mm long. *Disc* with stellate hairs *c.* 0.2 mm long. *Ovary* 3-locular; summit stellate-hairy, often densely so, with hairs *c.* 0.2 mm long. *Style* 2.2–2.5 mm long, slightly to well exserted beyond stamens, glabrous except at base; stigmatic lobes well developed, *c.* 0.3 m long. *Fruit* not seen at maturity but *c.* half-inferior when partly developed.

Other specimens examined. WESTERN AUSTRALIA: 5 km N of Carnamah, 9 Aug. 2000, *S. Hamilton-Brown s.n.* (PERTH); 8 km N of Carnamah on the Carnamah–Perenjori road, 10 Aug. 2000, *S. Hamilton-Brown s.n.* (PERTH); 37 km W of Morawa, 18 Aug. 1997, *F. Keast* M7B 225 (PERTH); Bencubbin–Kellerberrin road at 1.9 km N of Durokoppin Rd, 31°24'S, 117°46'E, 23 Aug. 2000, *S.J. Patrick* 3748 (PERTH); 13 km NE of Yandanooka, off Moffet Rd on private land, Sep. 1998, *R. Soullier* 616 (PERTH).

Distribution and habitat. Occurs mainly in the Morawa area, extending from Yandanooka to Carnamah, with an isolated record south-east near Kellerberrin, growing on the crests of slopes of hills with granite, laterite or other rock substrates. (Figure 1C)

Flowering period. August to September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Although only collected for the first time in 1997, this taxon is now known from at least six closely clustered populations and from an additional locality *c.* 300 km away. There is also an unconfirmed record from near Moora.

Etymology. From the Latin word *stellulatus* (with little stars) as this species is distinguished from the other members of the *C. arbutiflora* complex by the sparse indumentum of minute stellate hairs on its stems.

Affinities. This taxon was previously confused with *Cryptandra intermedia* but differs in its sparser minute stellate indumentum on the young stems, its usually more exserted style and its longer stigmatic lobes; it probably also tends to have a larger habit. It is also very closely related to *Cryptandra nola*, differing in its glabrous flowers, the more discrete stellate hairs on its stems, its glabrous outer bracts and its generally longer and less hairy leaves. In *C. nola*, unlike in *C. stellulata*, there are simple hairs on the midvein of the leaf undersurface and the upper leaf surface is often minutely stellate-hairy.

Cryptandra stellulata is largely geographically distinct from both *C. nola* and *C. intermedia*, occurring mainly south of *C. nola* and mainly inland of *C. intermedia*.

Notes. Previously known as *Cryptandra* sp. Morawa (*F. Keast* M1C 253). Fruiting material with mature seeds is needed for this species to complete its description.

The *Cryptandra minutifolia* complex

A taxonomically difficult species group referred to here as the *Cryptandra minutifolia* complex is characterised by having densely clustered leaves with a recurved mucro and usually with the petiole completely hidden by the stipules, non-spinescent branchlets, and large flowers each surrounded by many involucral bracts. The floral tube is usually fully or almost fully concealed within the tight involucre of bracts in flower but sometimes emerges in fruit, although, as the floral tube is already long in flower, it does not enlarge much in proportion to its length in flower and possibly sometimes does not enlarge at all. As is common in the genus *Cryptandra*, the petals are minutely papillose on the outer surface, the fruit is half-inferior and the large aril always has its 3 lobes well developed.

When this complex was examined by Rye (1995b), four taxa were formally recognised as *Cryptandra aridicola*, *C. leucopogon*, *C. minutifolia* subsp. *brevistyla* and *C. minutifolia* subsp. *minutifolia*. Further study of this complex following the collection of many extra specimens has resulted in the recognition of three new taxa, *C. beverleyensis*, *C. crispula* and *C. exserta*. The first two of these new species undoubtedly belong to the complex but the last of them is somewhat atypical, and so six or seven taxa are now recognised in the *Cryptandra minutifolia* complex.

The existence of a few atypical specimens that might be hybrids or additional new taxa continue to confuse the picture, and the group needs further study and collection, especially of good fruiting material with mature seeds. All members of the complex are listed below and full descriptions are given for two new species and the two previously published taxa in which they had previously been included.

6. Cryptandra aridicola Rye, *Nuytsia* 10: 264–265 (1995). *Type:* Edjudina Station, Western Australia, 9 July 1989, *H. Pringle* 2380 (*holo:* PERTH 01177591; *iso:* CANB, MEL, PERTH 05929105).

Description and illustration. Rye (1995b: fig. 3F–K).

Selected specimens examined. WESTERN AUSTRALIA: Boingaring Rocks, Dundas Nature Reserve, 143.5 km E from Esperance–Norseman highway along Telegraph Track, 12 July 1995, *G.F. Craig* 3211 (PERTH); 1 km E of Goongarrie Hill, 5 July 1995, *R.J. Cranfield* 9840 (PERTH); Newman Rock, 50 km W of Balladonia on Eyre Highway, 26 Aug. 1997, *S. Donaldson* 1300 (PERTH). SOUTH AUSTRALIA: no material examined to date but recorded from 29 km E of Serpentine Lakes, Great Victoria Desert, 24 Aug.1980, *D.E. Symon* 12525 (AD).

Notes. New Western Australian material has extended the known geographic distribution somewhat (Figure 2A) but has not significantly altered the range of morphology previously recorded for this species. Much more significant is a new collection from South Australia just east its border with Western Australia (J. Kellermann pers. comm.). The full distribution of *C. crispula* occurs within the range of *C. aridicola* but there are no known intermediates.

Cryptandra aridicola is one of the members of the *Cryptandra minutifolia* complex for which mature seeds have not yet been collected. This species is distinguished from the remainder of the complex by its long petal claws and long style. It also tends to have longer narrower sepals.

7. Cryptandra beverleyensis Rye, *sp. nov.*

Cryptandrae minutifoliae affinis sed foliis longioribus et floribus minis pilosis differt.

Typus: Beaufort River Water Reserve, Arthur River to Kojonup, Western Australia, 31 Aug. 2003, *G.J. Keighery & B.J. Keighery* 508 (*holo:* PERTH 007122950; *iso:* CANB).

Shrubs 0.4–1.3 m high. *Branchlets* not spinescent. *Young stems* densely hairy at first with a white indumentum of stellate and simple hairs (the two types of hairs somewhat tangled and closely pressed to the stems making them difficult to distinguish), becoming glabrous. *Stipules* 1.2–1.7 mm long, acute to acuminate, ciliate, outer surface often with a few hairs along midvein. *Petioles* 0.3–0.5 mm long, concealed by united base of stipule pair or shortly exserted. *Leaf blades* narrowly oblong, the larger ones 2.5–4 × 0.4–0.7 mm, with a recurved mucro 0.1–0.3 mm long; lower surface concealed by the recurved to revolute margins, densely white-hairy; upper surface smooth or with minute acute broad protrusions, glabrous. *Bracts* 12–14, broadly ovate to oblong-elliptic, ciliate; the inner ones 2.3–3.5 mm long, obtuse, ciliolate, with outer surface glabrous. *Flowers* usually 2–8 per branchlet in a terminal cluster or short spike-like arrangement, white. *Floral tube* 2.5–3.5 mm long (up to 4 mm long in fruit); adnate part of tube 0.6–0.8 mm long, largely glabrous (with scattered stellate hairs mainly between the ribs) to densely hairy; free part 2–3 mm long, glabrous throughout or with hairs similar to those on sepals in distal part or more densely hairy in distal half. *Sepals* 2–3 mm long, largely glabrous but with small hairs in central part to hairy throughout with a close stellate indumentum and simple hairs; simple hairs antrorse to appressed, 0.1–0.3 mm long. *Petals* 1.3–1.6 mm long; claw 0.2–0.4 mm long. *Disc* with stellate hairs 0.2–0.3 mm long. *Ovary* 3-locular; summit with stellate hairs 0.4–0.5 mm long. *Style* 2.5–3.5 mm long, glabrous except at extreme base. *Fruit* fully concealed within the floral tube and bracts, half-inferior, *c.* 3 × 2.2 mm, stellate-hairy on summit. *Seeds* not seen at maturity, the largest seen *c.* 2.5 mm long with a body *c.* 2.2 mm long and a 3-lobed whitish aril *c.* 0.6 mm long.

Other specimens examined. WESTERN AUSTRALIA: 10 km SW of Goomalling on Goomalling–Toodyay road, 17 Sep. 1994, *P. Armstrong s.n.* (PERTH); Doyle Rd, SE of Bokal, 29 Aug. 1994, *V. Crowley* DKN 373 (PERTH); Doyle Rd, SE of Bokal, 17 Aug. 1995, *V. Crowley* DKN *s.n.* (PERTH); Beecroft Rd, *c.* 500 m E of Forrest Rd intersection, Goomalling, 26 Sep. 2000, *R. Davis* WW10-34 (PERTH); Kellerberrin, York District, 4 Sep. 1897, *A.E. Lankester s.n.* (PERTH); Beverley Airfield Reserve, *c.* 1 km S of Beverley townsite, 18 Sep. 2000, *M. Ochtman & D. Lynch* 48 (PERTH); Kokeby Reserve, 22 Sep. 2001, *M. Ochtman* KO492 (PERTH).

Distribution and habitat. Distributed in the area surrounding Beverley in the South West Botanical Province of Western Australia, extending from Goomalling south to Beaufort River and eastwards to Kellerberrin. Occurs in clay soils sometimes also with sand, often with lateritic gravel, in eucalypt woodlands, often with Wandoo or Salmon Gum dominant. (Figure 2B)

Flowering period. August to September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. The known range of this species is *c.* 250 km. Except for one very old collection from Kellerberrin, this taxon is represented at PERTH by eight specimens collected from the mid 1990s onwards, all or mostly from different localities. There is also an older collection from near Narrogin (*H. Eichler* 15858) housed at AD (J. Kellermann pers. comm.). The species is not as common as many other *Cryptandra* species from the same general area but is perhaps poorly collected rather than really needing to be included on the priority list.

Etymology. Named after the town of Beverley where this species has been collected and which is fairly central to its known range.

Affinities. This species is a largely geographically separated member of the *Cryptandra minutifolia* complex, occurring further west and tending to have its flowers less hairy than all other members of the complex. Its leaves are almost as long and narrow on average as those of *C. leucopogon* but that species differs in having terminal long tufts of hairs on the sepals and long hairs on the ovary summit.

Notes. When *Cryptandra minutifolia* subsp. *minutifolia* was described in Rye (1995b), the presence of an atypical specimen from Kellerberrin with long leaves was noted. The Kellerberrin specimen and a number of recent additional collections of *Cryptandra beverleyensis* were later housed under the name *Cryptandra* sp. Beverley (*M. Ochtman & D. Lynch* 48).

The description of the fruit and seeds given above were based on an atypical collection (*R. Davis* WW10-34), which was the only one collected in mature fruit. This specimen is atypical in having long pedicels exserted from the stipule pairs and needs further study.

8. Cryptandra crispula Rye, *sp. nov.*

Cryptandrae minutifoliae affinis sed foliis longioribus, glaucis, et pilis sepalorum longioribus differt.

Typus: 76 km E of Norseman on Eyre Highway, Western Australia, 16 August 1995, *R.J. Cranfield* 10039 (*holo:* PERTH 04390350; *iso:* MEL).

Shrubs 0.25–0.9 m high. *Branchlets* not spinescent. *Young stems* with a dense matted indumentum at first of long very fine hairs, the individual hairs too tangled for their type (whether simple or stellate) to be readily determined but both stellate hairs and simple present, becoming glabrous. *Stipules* 1.5–2.5 mm long, acute to acuminate, ciliate. *Petioles c.* 0.2 mm long. *Leaf blades* narrowly oblong, 2.5–4 × 0.6–0.8 mm, with recurved to revolute margins completely or almost completely concealing the lower surface, with a recurved whitish mucro 0.2–0.4 mm long; lower surface white-hairy. *Bracts* 11 or 12, broadly ovate to oblong-elliptic, inner surface of outer bracts with long hairs along midvein; inner bracts 3–3.5 mm long, obtuse, long-ciliate; outer surface glabrous around margin, minutely hairy inside. *Flowers* usually 2–5 per branchlet in a cluster, white. *Floral tube* 2–2.3 mm long (enlarging slightly in fruit), densely stellate-hairy; adnate part of tube 0.7–0.9 mm long, densely minutely stellate-hairy; free part 1.2–1.6 mm long, rather densely hairy in distal half, becoming more sparsely hairy below. *Sepals* 2–2.2 mm long, very densely hairy with stellate and crisped/tangled simple hairs, the apex hidden by a tuft of hairs 1–1.5 mm long. *Petals* 0.9–1.1 mm long; claw 0.2–0.3 mm long. *Disc* with stellate hairs *c.* 0.2 mm long. *Ovary* 3-locular; summit with stellate hairs 0.25–0.35 mm long. *Style* 0.9–1.2 mm long, extreme base with stellate hairs. *Fruit* fully concealed within the closed sepals and bracts but probably sometimes partially exserted from floral tube, *c.* half-inferior, *c.* 2.5 × 2–2.3 mm, stellate-hairy. *Seeds* not seen at maturity, the largest *c.* 2.3 mm long, with a body *c.* 1.7 mm long and a whitish 3-lobed aril *c.* 0.8 mm long.

Other specimens examined. WESTERN AUSTRALIA: 88.9 km E along Eyre Highway from Norseman, 17 July 2002, *R. Davis* 10312 (AD, NSW, PERTH); 320 mile peg on Great Eastern Highway [*c.* 13 km W of Bullabulling], 10 Oct. 1974, *H. Demarz* 5269 (PERTH); 75 km ENE of Norseman, 9 Sep. 1973, *N.N. Donner* 4655 (PERTH); 19 km SSW Queen Victoria Rock, 24 Sep. 1993, *G.J. Keighery* 12954 (PERTH); 26 km SE of Karonie, 12 Aug. 1981, *K.R. Newbey* 8500 (CANB, PERTH).

Distribution and habitat. Distributed in the South Western Interzone of Western Australia in the region surrounding Lake Lefroy. Extends from near Bullabulling east to near Karonie and south-east to near Fraser Range. Recorded mainly in sandy soils. (Figure 2D)

Flowering period. July to September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Although known only from six collections, this species is unlikely to be endangered as it occurs in a poorly known inland area where access is often difficult. The known distribution of this taxon is over 200 km long.

Etymology. From the diminutive of the Latin word *crispus* – crinkled or curled, referring to the crisped long hairs on the sepals.

Affinities. This member of the *Cryptandra minutifolia* complex has somewhat glaucous leaves of a similar length to those of *C. aridicola*, long hairs terminating the sepals as in *C. leucopogon* and a short style like that of *Cryptandra minutifolia* subsp. *brevistyla*. It differs from all these taxa in its greater tendency to have the hair tufts on the sepals crisped.

Previously this species was included within *Cryptandra minutifolia* subsp. *brevistyla* because of the existence of a few specimens that bridged the gap between the two taxa to some degree. See the notes under *C. minutifolia* subsp. *brevistyla* regarding two atypical specimens that have leaves similar in length to those of *C. crispula*. Placement of those specimens needs to await further collection of them but, on the basis of their distribution, broad green leaves and shorter hairs on the sepals, they certainly fit better in *C. minutifolia* subsp. *brevistyla* and do not appear to affect the recognition of *C. crispula*.

9. Cryptandra leucopogon Meisn. ex Reissek *in* J.G.C. Lehmann, Pl. Preiss. 2: 287–288 (1848). *Type:* Gordon River, Western Australia, 7 November 1840, *L. Preiss* 752 (*holo:* LD).

Selected specimens examined. WESTERN AUSTRALIA (all PERTH): Reserve 15266 in the Toolibin Catchment, 22 Nov. 1999, *E. Bennett & T. Sleep* 15266-40b; 3.1 km W of Floater Rd on Hayes Rd, *c.* 42 km SE of Lake King township, 7 Nov. 1996, *B.J. Lepschi* 3234 *& T.R. Lally*; 0.6 km N of Hyden-Norseman road on track to North Ironcap, 6 Nov. 2004, *B.L. Rye* 241184 *& M.E. Trudgen*.

Affinities. This is the most clearly distinct member of the *Cryptandra minutifolia* complex, differing from all the rest by its more or less cylindrical leaves up to 5 mm long, very long hairs on the ovary summit and its sepal indumentum. The sepals have a protruding apical tuft of hairs 1 mm or more long and at least four times longer than the indumentum occurring below.

Notes. The distribution of this species (Figure 2B) overlaps the ranges (Figure 2B–E) of several other members of the *Cryptandra minutifolia* complex but no hybrids are known.

Fruiting material of *Cryptandra leucopogon* has not been described previously. In fruit the style is *c.* 3.3 mm long and its basal third is densely stellate-hairy. The fruit is fully concealed within the floral tube and bracts, *c.* half-inferior, 1.7–2.3 × 1.5–1.6 mm and densely hairy on the summit. Seeds are 1.6–1.7 mm long, with a body 1.2–1.3 × 0.6–0.7 mm and a whitish, 3-lobed aril 0.5–0.8 mm long. The testa has a very dark base and is pale to uniformly golden brown above or with the margin and centre somewhat differently coloured.

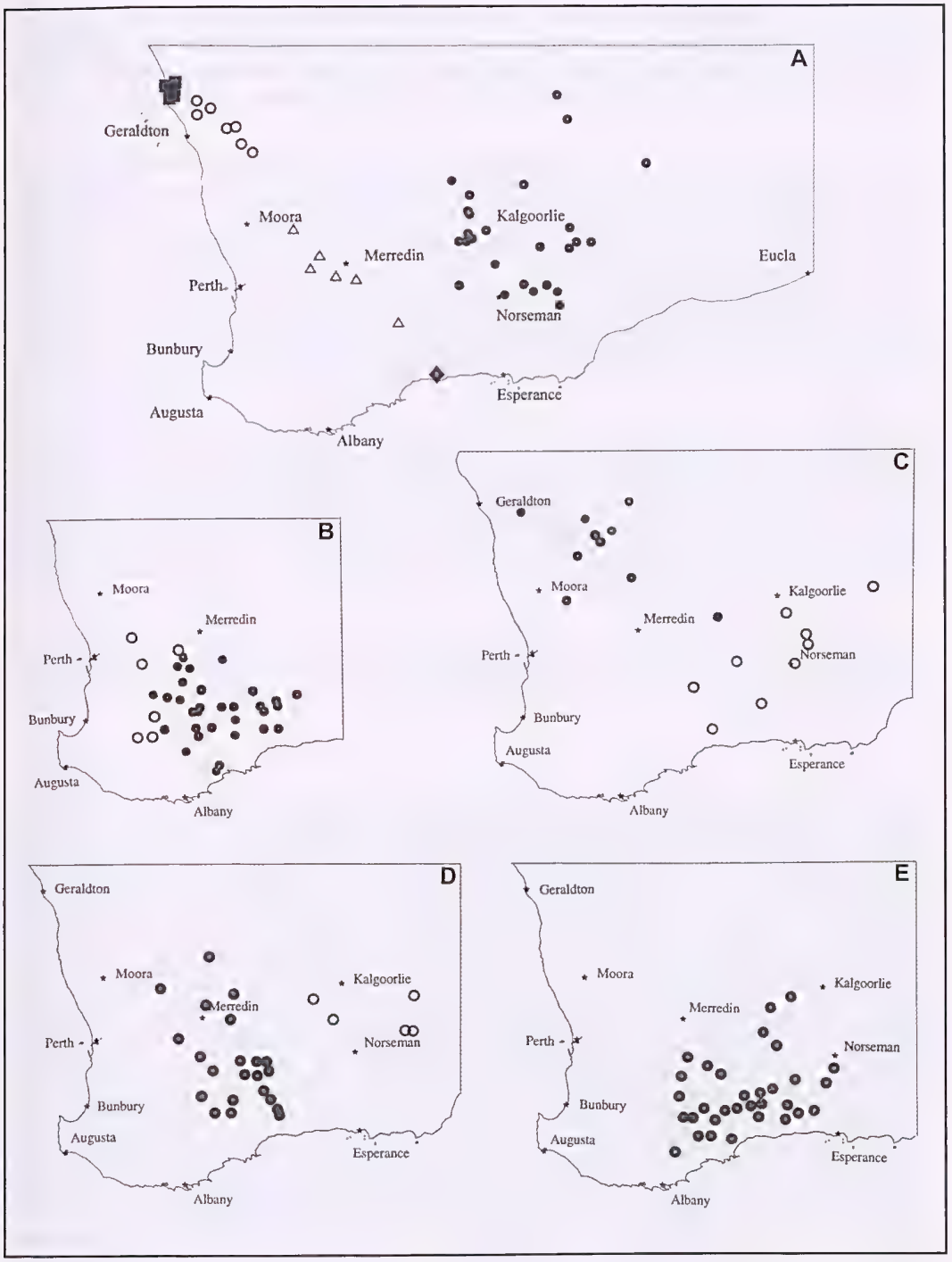

Figure 2. Geographic distributions. A – *Cryptandra aridicola* ●, *C. craigiae* ♦ , *C. dielsii* △ , *C. glabriflora* Benth. ◘ and *C. nola* ○; B – *Cryptandra beverleyensis* ○ and *C. leucopogon* ●; C – *Cryptandra graniticola* Rye ○ and *C. micrantha* ●; D – *Cryptandra crispula* ○ and *C. minutifolia* subsp. *minutifolia* ● ; E – *Cryptandra minutifolia* subsp. *brevistyla*.

10. Cryptandra minutifolia Rye, *Nuytsia* 10: 273 (1995). – *Cryptandra parvifolia* Turcz., *Bull. Soc. Imp. Nat. Moscou* 31: 459 (1858), *nom. illeg. non Cryptandra parvifolia* (Hook.) Hook.*f. Type:* south-western Australia [from north of Moore River to King George Sound and West Mt Barren, Western Australia], 1847, *J. Drummond* coll. 4, n. 156 (*holo:* KW *n.v.*; *iso:* PERTH 01599313).

Notes. When this species was first described in Rye (1995b), there were far fewer specimens available for study. The ranges of *Cryptandra minutifolia* subsp. *minutifolia* and subsp. *brevistyla* appeared to have only a small overlap and the occurrence of a few intermediates in the area of overlap suggested that subspecies status was appropriate. The removal of atypical specimens (described here as *C. beverleyensis* and *C. crispula*) and the addition of more widely collected specimens of subsp. *minutifolia* and subsp. *brevistyla* have shown the two subspecies to have less variable morphology than previously thought and a larger area of overlap in their ranges. Most specimens can be readily identified but specimens of intermediate morphology are fairly common in the area where the distributions overlap.

Morphological differences between the typical specimens of the two subspecies seem to be as great as those between each of them and the new taxa *C. beverleyensis* and *C. crispula*, but there appear to be too many intermediates to warrant their recognition as separate species. As far as it is currently known, the fruiting material of the two taxa separates them more effectively than flowering material, with differences in floral tube length and seed size, but this may just reflect the paucity of fruiting material. Further fruiting collections and field studies of the two taxa seem to be needed to assess their taxonomic status further.

10a. Cryptandra minutifolia Rye subsp. **minutifolia**

Illustration. Rye (1995b: fig. 3L–N).

Shrubs 0.2–0.6(0.9) m high. *Branchlets* not spinescent. *Young stems* densely hairy at first with a white indumentum of stellate and simple hairs (the two types of hairs somewhat tangled and closely pressed to the stems making them difficult to distinguish), becoming glabrous. *Stipules* up to 2.5 mm long, acute to acuminate, ciliate, outer surface often with a few hairs along midvein. *Petioles* 0.2–0.3 mm long, concealed by united base of stipule pair. *Leaf blades* appearing sessile, oblong-elliptic, 0.8–1.7 × 0.6–0.8 mm, with a recurved mucro 0.1–0.2 mm long; lower surface concealed by the recurved to revolute margins, densely white-hairy; upper surface smooth or with minute acute broad protrusions, glabrous. *Bracts* 12–14, broadly ovate to oblong-elliptic, ciliate; the inner ones 2.5–3.5 mm long, obtuse, ciliolate, with outer surface glabrous. *Flowers* usually 2–5 per branchlet in a terminal cluster but sometimes more numerous, white. *Floral tube* 2.5–3.5 mm long (enlarging to 3.5–4 mm long in fruit); adnate part of tube *c.* 0.7 mm long, largely glabrous (with stellate hairs mainly between the ribs) to densely hairy; free part 1.8–2.8 mm long, glabrous throughout or with hairs similar to those on sepals in distal part or more densely hairy in distal half. *Sepals* 2.7–3.5 mm long, with a close stellate indumentum and simple hairs; simple hairs antrorse to appressed, 0.3–0.5 mm long. *Petals c.* 1.1 mm long; claw 0.2–0.4 mm long. *Disc* with stellate hairs 0.2–0.3 mm long. *Ovary* 3-locular; summit with stellate hairs 0.2–0.4 mm long. *Style* 2.5–3.6 mm long, glabrous in distal half, basal half or extreme base densely stellate-hairy. *Fruit* fully concealed within the floral tube and bracts, *c.* half-inferior, 2.3–2.5 × 2–2.3 mm (possibly not full-sized as not seen after dehiscence), densely hairy. *Seeds* not seen at maturity, the largest *c.* 2.3 mm long, with a body *c.* 1.7 mm long and a whitish, 3-lobed aril 0.6–0.8 mm long.

Selected specimens examined. WESTERN AUSTRALIA: Bounty Mine, *c.* 3 km S of North Ironcap, 7 Sep. 1994, *G. Barrett s.n.* (PERTH); S side of Bairstow Rd, 200 m W of Fourteen Mile Rd, Lakeland Nature Reserve, *c.* 33 km SW of Newdegate, 15 Oct. 1999, *G.J. Keighery & N. Gibson* 5548 (PERTH); Chiddarcooping Hill Nature Reserve, 29 Sep. 1984, *A.S. Weston* 14089 (PERTH).

Distribution. More or less restricted to the South West Botanical Province, extending from Manmanning east to Chiddarcooping Hill and south-east to Ravensthorpe Range. (Figure 2D)

Affinities. See notes under *Cryptandra minutifolia* subsp. *brevistyla.*

Notes. The description of *Cryptandra minutifolia* subsp. *minutifolia* in Rye (1995b: 275) is accurate except for the outlying large measurements given for the leaves. It was noted there that the single specimen with these measurements was atypical, and that specimen is now included in the new species *C. beverleyensis*.

Previously only flowering material had been seen. Three recently incorporated specimens that have almost mature fruits are cited above and measurements taken from them have been added to the description of this taxon. These three fruiting specimens have the style 3–3.5 mm long, with its basal half densely stellate-hairy.

10b. Cryptandra minutifolia subsp. **brevistyla** Rye *Nuytsia* 10: 274–275 (1995). *Type:* 2 km SW of Mt Madden, which is 22 km SE of Lake King township, Western Australia, 6 August 1968, *P.G. Wilson* 6813 (*holo:* PERTH 01507540; *iso:* CANB, MEL).

Illustration. Rye (1995b: fig. 3F–K).

Shrubs (0.1)0.2–0.6(1) m high. *Branchlets* not spinescent. *Young stems* very densely hairy at first with a white indumentum of stellate and simple hairs (the two types of hairs tangled and difficult to distinguish), becoming glabrous. *Stipules* 1.3–2.5 mm long, acuminate, outer surface often hairy. *Petioles* 0.2–0.3 mm long, concealed by united base of stipule pair. *Leaf blades* appearing sessile, oblong-elliptic, usually 1–2 × 0.6–0.8 mm, with a recurved mucro 0.1–0.2 mm long; lower surface concealed by the recurved to revolute margins, densely white-hairy; upper surface smooth or with minute acute broad protrusions, glabrous. *Bracts* (8)9–12, broadly ovate to oblong-elliptic; inner ones 2–3 mm long, obtuse, ciliate or long-ciliate, with outer surface minutely hairy or glabrous. *Flowers* usually 3–10 but sometimes 1 or 2 per branchlet in a terminal spike-like or head-like cluster, white or occasionally pink. *Floral tube* 1.5–2.3 mm long (scarcely enlarging or up to 3 mm long in fruit); adnate part of tube 0.6–0.8 mm long, densely hairy; free part 1–1.5 mm long, glabrous throughout or with hairs similar to those on sepals in distal part or more densely hairy in distal half. *Sepals* 1.5–2.5 mm long, with a close stellate indumentum and simple hairs; simple hairs antrorse to appressed, the apical ones 0.3–0.5 mm long. *Petals c.* 1 mm long; claw 0.1–0.3 mm long. *Disc* with stellate hairs *c.* 0.3 mm long. *Ovary* 3-locular; summit with stellate hairs 0.3–0.4 mm long. *Style* 0.7–1.7(2.5) mm long, glabrous for most of length, base densely stellate-hairy. *Fruit* largely to fully concealed within the floral tube and bracts, *c.* half-inferior, 2–2.5 × 1.6–2.3 mm, densely hairy. *Seeds* 1.7–1.9 mm long; body 1.4–1.5 × 0.8–1.1 mm, with variable colouring, often dark with pale or darker markings around the border, sometimes pale with prominent darker mottling; aril 0.6–1.1 mm long, whitish or yellowish, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: Cascade, 104 km NW of Esperance, 11 Aug. 1999, *R. Bruhn* 26/899 (PERTH); *c.* 7.5 km S along North Karlgarin Rd from intersection of Pederah Rd West, Pederah Nature Reserve, 20 Oct. 1999, *K. Kershaw* 2008 (PERTH); *c.* 41 km E of Newdegate on road to Lake King, 19 Oct. 1995, *B.J. Lepschi* 2207 (PERTH); 21.5 km by road *c.* E from Pingrup on Pingrup–Ravensthorpe road, 11 Oct. 1975, *G. Perry* 396 (PERTH); corner intersection of Airstrip Rd and Jilakin Rock Rd, *c.* 1 km E of Kulin, 16 Sep. 2001, *S. Murray* 491 (PERTH).

Long-leaved specimens: Frank Hann National Park, 6 Aug. 1978, *D. Monk* 131 (PERTH); 10 km Cascades Rd from E to W, 13 Aug. 2000, *E. Tink* 502 (PERTH).

Distribution. Occurs in the South West Botnaicl Province and the South Western Interzone, extending from the Barker Lake area south-west to Kulin, south to the Stirling Range area and south-east to the Lort River area. Previously (Rye 1995) the range was given as extending from near Coolgardie to Stirling Range and east to Karonie but several of the inland specimens are now included under *Cryptandra crispula*. (Figure 2E)

Flowering period. July to September.

Notes. Two specimens that are somewhat intermediate between *Cryptandra crispula* and *C. minutifolia* subsp. *brevistyla* are cited separately above. Their leaves are longer than usual for subsp. *brevistyla* and their sepals have the longer hairs concentrated towards the apex but less than 1 mm long so not as long as in *Cryptandra crispula*. These two specimens are on or near the easternmost edge of the range of subsp. *brevistyla*.

Three of the specimens cited above have fruits with mature seeds, including *G. Perry* 396 which has seeds that are as prominently mottled as those of many *Stenanthemum* species and a few *Spyridium* species. The other two fruiting specimens cited above have seed colouring more typical of the genus *Cryptandra*, but the seed illustrated in Rye (1995b: fig. 3K) is also mottled. This is the only taxon so far within the genus *Cryptandra* in which prominently mottled seeds have been reported, although it appears that mottled seeds are present only in about half of the specimens.

The *Cryptandra connata* complex

This complex comprises two species that have adjacent but non-overlapping ranges in the Eremaean Botanical Province of Western Australia, with one species extending slightly into the South West Botanical Province.

Both species were included in the genus *Blackallia* when it was first described by Gardner (1942), together with the unrelated species *B. biloba*, which had previously been described as *Cryptandra nudiflora* F. Muell. While *Cryptandra imbricata* was not described there as a distinct species, Gardner included it by citing a specimen of *C. imbricata* as an 'additional locality' under *Cryptandra* [as *Blackallia*] *connata*. Kellermann *et al.* (2007) have nominated *B. biloba* [= *Blackallia nudiflora* (F.Muell.) Rye & Kellermann] as the lectotype for *Blackallia* and excluded the other two species from *Blackallia* because they match the genus *Cryptandra* in their vegetative characters, inflorescence characters and the presence of stellate hairs on the disc.

Cryptandra connata and *C. imbricata* are atypical of *Cryptandra* in their disc orientation and fruit and seed characters. They have an obovoid ovary and a larger and more spreading disc, which

is united at the base to the floral tube and has its free part appressed to the floral tube. Typically in *Cryptandra*, the ovary is more or less ellipsoid and the disc is united to, or at least closely appressed to, the ovary, which it covers or largely covers in the young flower.

Cryptandra connata and *C. imbricata* have a number of characters in common with the unrelated genus *Granitites* Rye (illustrated in Rye 1996: fig. 1). *Granitites* is closely related to *Alphitonia* and, like that genus, is currently unplaced in any of Richardson *et al.*'s (2000) tribes of Rhamnaceae. The most notable characters shared by the two *Cryptandra* species and *Granitites* are the stout spinescent branchlets, large beaked fruit and uniformly coloured seed body with a very large coloured aril. Spinescent branchlets are fairly common in *Cryptandra* but not the beaked fruit.

Typically in *Cryptandra*, the seed is darkened at the base and has a smaller clear-translucent or whitish to pale ferruginous aril, which is usually moderately large and with three distinct lobes. It appears that the very large colourful aril and similarly shaped fruits of this odd group of *Cryptandra* species and *Granitites* is a convergence in adaptation for a similar means of seed dispersal. The aril in these two *Cryptandra* species is far larger than any in the remainder of the Pomaderreae and also more prominent than in *Granitites*.

The lack of a darkened base to the seed in the two *Cryptandra* species distinguishes them not only from other *Cryptandra* species but also from other Pomaderreae, as the entire tribe is characterised by the presence of a darkened base to the seed. Perhaps this difference is not so much that there is a lack of dark pigment on the base of the seed as that the remainder of the seed has become darkened to match the base in *Cryptandra connata* and *C. imbricata*.

11. Cryptandra connata C.A. Gardner, *J. Roy. Soc. Western Australia* 14: 80, Plate 3H–L (1928). – *Blackallia connata* (C.A. Gardner) C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 184 (1942). *Type:* Sandstone, Western Australia, 19 July 1927, *C.A. Gardner s.n.* (*lecto:* PERTH 01599259, here designated; *isolecto:* PERTH 01599240).

Typification. Two specimens at PERTH were labelled as type material without either being indicated as the holotype. Both sheets had similar material but one also had line drawings of many parts of the plant drawn onto it. The sheet with the drawings was therefore selected as the lectotype for this species.

12. Cryptandra imbricata Rye, *sp. nov.*

Cryptandrae connatae affinis sed bracteis et floribus magis pilosis, tubi florali breviore involucrum bracteorum vix excedenti differt.

Typus: 45 miles [72.4 km] north of Mullewa, Western Australia, 8 July 1969, *A.M. Ashby* 2881 (*holo:* PERTH 01515802; *iso:* CANB).

Shrubs spreading and often domed or rounded, with intricately interlaced divaricate branches, 0.5–1.5 m high. *Spinescent branchlets* mostly 5–20 mm long, with several clusters of leaves, the lower leaves of each cluster shed leaving a tight cluster of empty stipules with only the uppermost leaves attached. *Young stems* with a dense indumentum at first of stellate hairs and usually also larger antrorse to patent simple hairs 0.3–0.6 mm long, becoming glabrous. *Stipules* 0.5–1.3 mm long, acute to acuminate, ciliate, glabrous outside or with minute hairs at first. *Petioles* 0.4–0.6 mm long. *Leaf*

blades narrowly oblong-elliptic to linear, 1.4–3.5 × 0.4–0.6 mm, with recurved to revolute margins partially to completely concealing the lower surface, scarcely mucronate; lower surface with large simple hairs along midvein, the hairs all or mostly antrorse or appressed, a minority sometimes patent. *Bracts* 11–14, broadly ovate to oblong-elliptic, the inner ones 2–3.3 mm long, obtuse or acute, prominently ciliate; outer surface usually with long fine antrorse hairs. *Flowers* 1–7 (usually 2–5) per branchlet in a spike-like cluster 7–11 mm wide, white. *Floral tube* 2.5–3.1 mm long (enlarging to 3–3.5 mm in fruit), densely stellate-hairy; adnate part of tube 0.3–0.5 mm long; free part 2.1–2.6 mm long, with a few long hairs. *Sepals* 2–3 mm long, densely stellate-hairy and with larger simple hairs at least towards the apex; simple hairs 0.4–0.8 mm long. *Petals* 1.3–1.6 mm long; claw 0.3–0.5 mm long. *Disc* with stellate hairs *c.* 0.2 mm long. *Ovary* 3-locular, superior, moderately densely hairy above the spreading densely hairy disc, with scattered simple hairs 0.3–0.6 mm long and more numerous shorter stellate hairs. *Style* 1.3–2.1 mm long. *Fruit* with the basal half concealed within the floral tube and bracts and the distal half exserted, 6–7 × 3.5–4 mm including the beak, densely hairy. *Seeds c.* 3.5 mm long; body *c.* 2 × 1.5 mm, very dark brown; aril *c.* 1.8 mm long, orange, truncate. (Figure 3A–G)

Other specimens examined. WESTERN AUSTRALIA: 30 miles [48 km] N of Cleary, 16 July 1967, *J.S. Beard* 4702 (PERTH); 50 miles [80 km] SW of Paynes Find, 8 Sep. 1938, *W.E. Blackall* 3857 (PERTH); Toolonga Nature Reserve, 33.4 km W of North West Coastal Highway on Butchers Track, 3 Sep. 1990, *A.H. Burbidge* 4507 (PERTH); 270 mile peg [9 km N of Paynes Find] on Paynes Find–Mount Magnet road, 20 July 1966, *A. Fairall* 1793 (PERTH); 9 km N of Paynes Find, 18 July 1994, *S.J. Patrick* 1884 (PERTH); 9.4 km N of Paynes Find, 18 July 1994, *S.J. Patrick* 1885 (PERTH); 12.5 km N of Paynes Find, 18 July 1994, *S.J. Patrick* 1886 (PERTH); Mount Gibson Station, 3.8 km from homestead road on track to Beanthiny Rock, 16 July 1996, *S.J. Patrick* 2664 (PERTH); Burnerbinmah Station, 800 m E of shearers quarters, 12 Sep. 1996, *S.J. Patrick* 2782 (PERTH); 2.3 km NE of Wurarga turnoff on Morawa–Yalgoo road, 20 Feb. 1997, *S.J. Patrick* 2905 (PERTH); Wuraga road, 700 m N of junction with Morawa–Yalgoo road, 20 Feb. 1997, *S.J. Patrick* 2909 (PERTH); 20 km N of Paynes Find, 1968, *S. Pfeiffer s.n.* (PERTH).

Distribution and habitat. Distributed mainly in the Eremean Botanical Province and extending slightly into the South West Botanical Province of Western Australia. Extends from Toolonga Nature Reserve south to Lake Moore. Occurs mainly in red sandy clay, one record from brown clayey soil on granite. (Figure 4A)

Flowering period. July to September.

Conservation status. Previously listed as Conservation Codes for Western Australian Flora: Priority Three, but now removed from the Priority List. The known range of this species is *c.* 400 km long, occurring in a range of landforms.

Etymology. From the Latin *imbricatus* – overlapping like roof tiles or shingles, referring to the overlapping bracts surrounding the base of the flower. Most *Cryptandra* species have this feature but it is better developed in *C. imbricata* than in many other species.

Affinities. Very closely related to *Cryptandra connata*, which occurs further inland and differs in having the outer surface of the bracts glabrous and the outside of the flowers glabrous except for a tuft of hairs towards the apex of each sepal. *Cryptandra connata* also has a longer floral tube and fairly erect sepals, the tube being approximately twice as long as the whorl of bracts and strongly 'pinched in' at the summit in flower. In *C. imbricata*, the floral tube is only slightly longer than the whorl of bracts and is less contracted at the summit, and the sepals are often widely spreading. A greater proportion

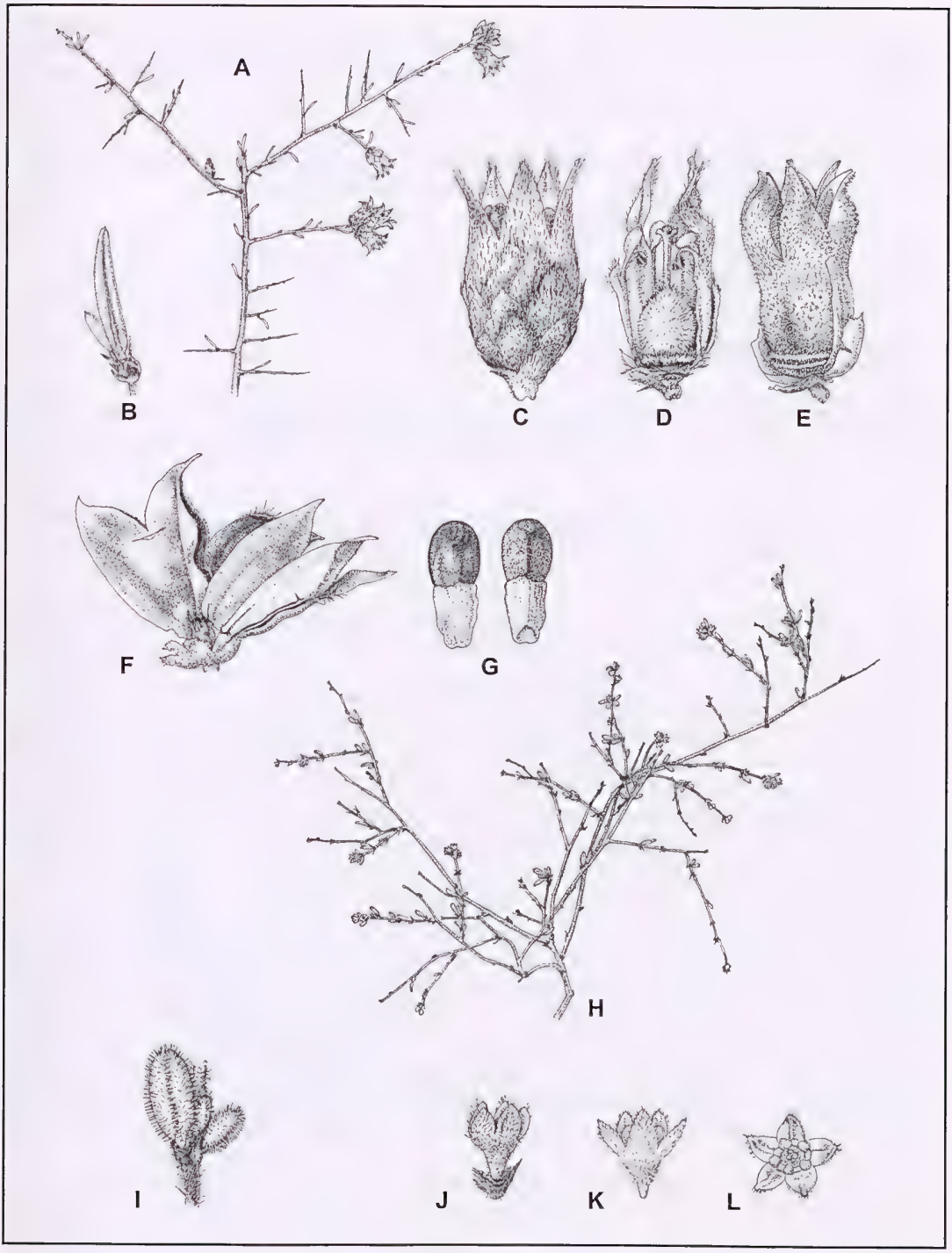

Figure 3. A–G. *Cryptandra imbricata*. A – flowering branch (×1), B – stipules and undersurface of leaf (×7), C – flower with bracts (×7), D – flower with part removed to show ovary and disc (×6), E – partially dehisced fruit (×6), F – fully dehisced fruit (×6), G – inner and outer surfaces of seed and aril (×6). H–L. *Cryptandra inconspicua*. H – flowering branch (×1), I – leaf cluster (×8), J – young flower and bracts (×8), K – flower and pedicel (×8), L – flower from top view (×8). Drawn from *A. Fairall* (A–C), *S. Pfeiffer s.n.* 1968 (D,E), *S.J. Patrick* 1885 (F,G) and *W.E. Blackall* 3049 (H–L).

of the fruit is concealed within the floral tube in *C. connata* and the sepals extend beyond the apex of the fruit, whereas in *C. imbricata* the fruit protrudes beyond the sepals. The limited records of flower colour on herbarium specimens also suggest that *C. connata* differs in having pink to red flowers, but possibly this colour does not develop until the fruiting stage.

Notes. One abnormality noticed among the *Cryptandra imbricata* specimens was that at least one of the flowers on *S.J. Patrick* 2263 had a 4-lobed stigma and 4-locular ovary.

Miscellaneous other species of *Cryptandra*

13. Cryptandra craigiae Rye, *sp. nov.*

Ramuli spinescentes pilis simplicibus; flores sessiles vel subsessiles bracteis c. 4 subtentis; floralis tubus parte libro infra 1 mm longo, pilis simplicibus; sepala pilis simplicibus; ovarium triloculare; stigma 3-lobatum.

Typus: NNE of Hopetoun [precise locality withheld], Western Australia, 13 May 2005, *G.F. Craig* 6438 (*holo:* PERTH 07129777; *iso:* MEL).

Shrubs erect at first, tending to become much more spreading, 0.1–0.25 m high, up to 0.35 m wide, single-stemmed at the base, not spinescent when young but with numerous spinescent branchlets at maturity. *Young stems* with a moderately dense to sparse indumentum of more or less appressed simple hairs 0.4–0.6 mm long; spinescent branchlets slender and often somewhat curved, mostly 10–25 mm long. *Stipules* 1.5–2.5 mm long, long-acuminate, ciliate, often hairy along midrib. *Petioles* protruding from the connate base of the stipule pair, 0.4–0.5 mm long, glabrous. *Leaf blades* linear in outline or very narrowly oblong, 4–5 × 0.6–0.8 mm, with recurved to revolute margins largely or completely concealing the lower surface; lower surface densely hairy but hairs often concealed; upper surface green, usually with denticulate to coarsely hair-like minute tubercles mainly towards apex; apical point 0.05–0.2 mm long. *Bracts c.* 4, ovate, *c.* 1.3 mm long, acute, ciliolate; outer surface glabrous or largely glabrous. *Flowers* in dense clusters 4–5 mm diam., usually 4–6 per cluster and one cluster terminating each branchlet, white or cream. *Floral tube c.* 1 mm long (enlarging in fruit), moderately densely hairy throughout but with indumentum tending to be more dense on adnate part; adnate part *c.* 0.4 mm long, green, with short stellate and simple hairs; free part 0.5–0.7 mm long, white or cream, with scattered simple antrorse to spreading hairs 0.4–0.5 mm long and more numerous very short simple hairs. *Sepals* 0.8–0.9 mm long, with simple hairs. *Petals c.* 0.6 mm long; claw *c.* 0.2 mm long. *Disc* densely stellate-hairy; hairs *c.* 0.2 mm long. *Ovary* 3-locular. *Style* 0.6–0.9 mm long; stigma 3-lobed. *Fruit* half-inferior, *c.* 2.5 mm long, densely minutely stellate-hairy on summit. *Seeds c.* 2 mm long; body *c.* 1.6 × 0.8 mm, with base very dark; aril *c.* 0.6 mm long, shortly 3-lobed.

Other specimens examined. WESTERN AUSTRALIA [precise localities withheld]: NNE of Hopetoun, early Oct. 2006, *J.A. Cochrane* 6031 (PERTH); NNE of Hopetoun, 10 May 2005, *G.F. Craig* 6408 (PERTH); NNE of Hopetoun, 13 May 2005, *G.F. Craig* 6425–6427 (PERTH); on Hopetoun–Ravensthorpe road, 2 June 2005, *G.F. Craig* 6474 (PERTH).

Distribution and habitat. Occurs near Hopetoun on the central south coast of the South West Botanical Province of Western Australia, mainly on low-lying sand dunes, on low rises between or adjacent to swampy areas, also recorded from a gutter on a disturbed road verge. (Figure 2A)

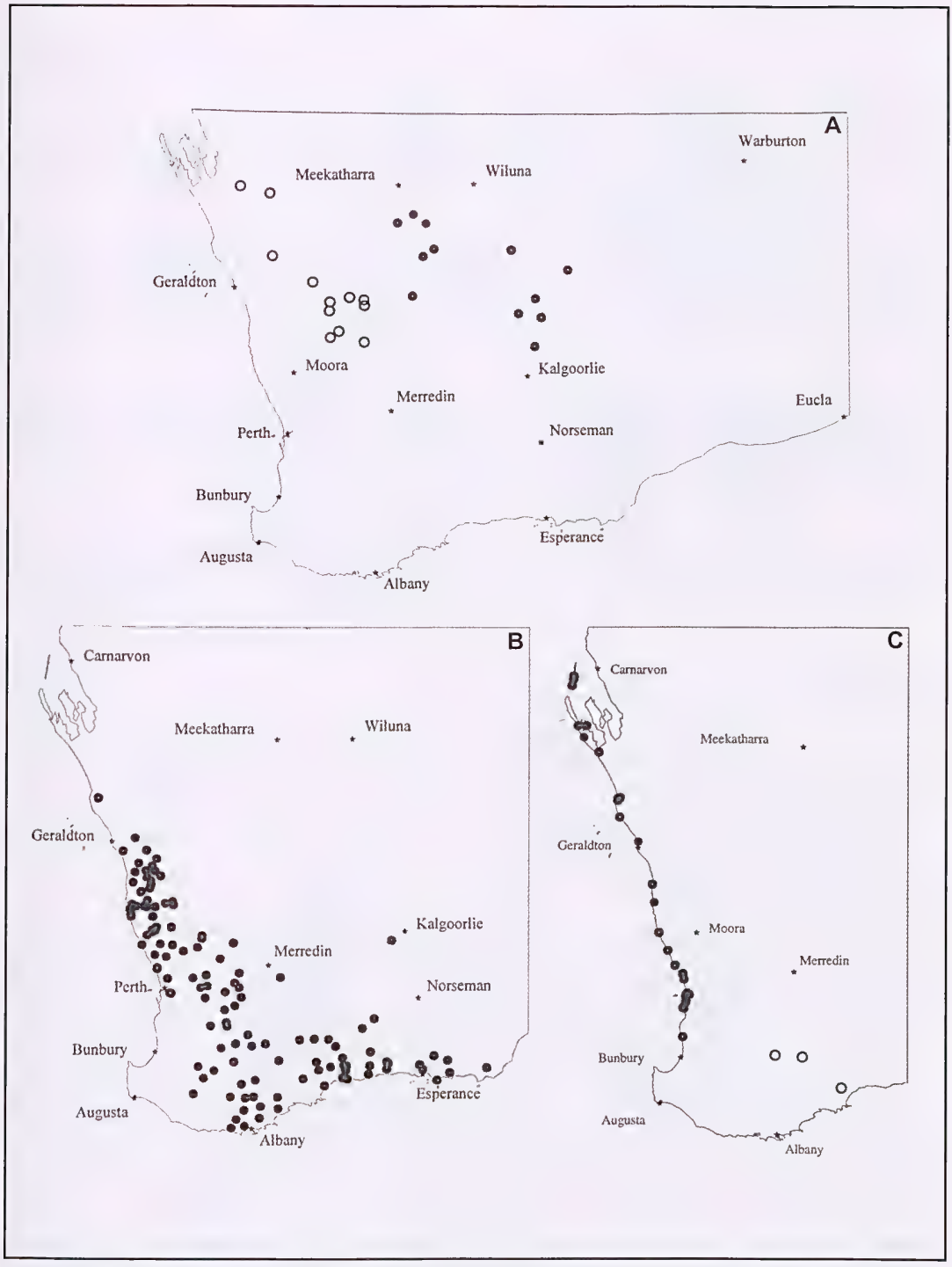

Figure 4. Geographic distributions of south-western Australian species. A – *Cryptandra connata* • and *Cryptandra imbricata* ○; B – *Cryptandra pungens*; C – *Cryptandra inconspicua* ○ and *C. mutila* •.

Flowering period. May to June.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. This species is known from just two populations *c.* 1 km apart.

Etymology. Named in honour of Gillian Craig, a consultant botanist who discovered this species and has made almost all of the known collections of it so far.

Affinities. The affinities of this species are unclear, but it might be closest to *Cryptandra scoparia* Reissek. It can be distinguished from *C. scoparia* by its more hairy floral tube but, as in that species, the hairs are all simple. The lack of stellate hairs on its stems and floral tube distinguishes *C. craigiae* from most members of its genus.

Notes. Previously known as *Cryptandra* sp. Hopetoun (*G.F. Craig* 6408). Gill Craig (pers. comm.) observed that seedlings lack the spinescent branchlets of the mature plants of this new species. This might explain some of the variation observed on specimens of several taxa, such as *C. mutila*, which appear to be unarmed in some collections and spinescent in others.

In the single fruiting specimen examined, which was collected in early October, the fruits appeared to be barely mature and the seeds were extremely pale except for a very dark base so the mature colouring of the seeds is still not certain.

14. Cryptandra dielsii C.A. Gardner ex Rye, *sp. nov.*

Cryptandrae polycladae simile sed apice foliorum manifeste recurvo, inflorescentia magis pilosa, bracteis involucralibus in quoque florem cingentibus differt.

Typus: Tammin, Western Australia, 1 September 1936, *C.A. Gardner s.n.* (*holo:* PERTH 01529722: *iso:* CANB, PERTH 01503804).

Shrubs spreading, 0.3–0.7 m high, intricately branched. *Branchlets* not spinescent. *Young stems* with a dense fine tangled indumentum; hairs appressed to patent, all or at least the larger ones apparently simple, the largest hairs 0.5–1 mm long. *Stipules* shortly connate at base to the outside of petiole, overlapping at the base to inside of the leaf, 1.7–2.3 mm long, long-acuminate, with cilia *c.* 0.3 mm long; outer surface usually with scattered hairs especially along the midvein. *Petioles* usually concealed by the connate base of the stipule pair, *c.* 0.2 mm long. *Leaf blades* linear to narrowly oblong, 2–5 × 0.6–0.8 mm, with recurved to revolute margins concealing the lower surface, the apex recurved, with a prominent mucro 0.1–0.3 mm long; lower surface hairy but hairs concealed except occasionally for a few protruding from the line where the recurved margins meet; upper surface smooth or with minute broad protrusions. *Inflorescence* very dense, head-like, 4–8 mm wide, mostly 6–9-flowered, the individual flowers not distinct, surrounded by large involucral bracts. *Involucral bracts* largely chartaceous but with a reduced leaf blade at summit. *Floral bracts* 2–4 per flower, usually 3 with the outer bract larger than the other two, mostly broadly elliptic, 1.8–3.5 mm long, apiculate to acuminate, hairy along the midvein, prominently ciliate acoss the broad summit, which is often toothed and/or emarginate, the cilia 0.3–0.7 mm long. *Flowers* white. *Involucral tube* 1.5–2 mm long (not seen in fruit), minutely stellate-hairy and with simple tangled antrorse hairs 0.8–1.3 mm long; adnate part of tube 0.7–1 mm long; free part of tube 0.8–1 mm long. *Sepals* 0.7–1.3 mm long, with a very dense

Figure 5. A–E. *Cryptandra dielsii*. A – flowering branch (×1), B – stipules and undersurface of leaf (×6), C – flower cluster (×4), D – flower (×6), E – flower dissected open (×6); F–I. *Cryptandra micrantha*. F – flowering branch (×1), G – spinescent flowering branchlet (×5), H – flower with glabrous disc (×15), I – flower with hairy disc (×15). Drawn from *B.H. Smith* 395 (A–E), *K.F. Kenneally* 1836 (F–H) and *H. Demarz* 3808 (I).

indumentum of spreading and tangled simple hairs 0.8–1.5 mm long. *Petals* 0.5–0.6 mm long; claw 0.1–0.2 mm long. *Disc* densely stellate-hairy; hairs *c.* 0.2 mm long. *Ovary* 3-locular; summit with hairs *c.* 0.3 mm long. *Style* 0.8–1.3 mm long, with minute papillae; stigma 3-lobed. *Fruit c.* two-thirds inferior, concealed within the floral tube, *c.* 2 mm long, stellate-hairy on summit. *Seeds c.* 1.6 mm long; body *c.* 1.35 × 0.8 mm, much compressed, base very dark, pale brown above; aril *c.* 0.5 mm long, whitish-translucent, 3-lobed. (Figure 5A–E)

Other specimens examined. WESTERN AUSTRALIA: Durokoppin Nature Reserve, 18 Sep. 1996, *L. Atkins* 187 (PERTH); Tammin, 4 Sep. 1922, *C.A. Gardner* 689 (PERTH); Tammin, May 1927, *C.A. Gardner s.n.* (PERTH); 18 km SE of Holt Rock, 17 Sep. 1976, *R. Hnatiuk* 760814 (PERTH); Kellerberrin–Yelbeni road, 0.6 km N of Yorkrakine Rock Rd, 23 Aug. 2000, *S.J. Patrick* 3743 & *L. Polomka* (PERTH); E edge of Durokoppin Nature Reserve, *c.* 20 m from W edge of Mission Rd, 0.8 km S of Brown Rd, 23 Aug. 2000, *S.J. Patrick* 3751 & *L. Polomka* (PERTH); Durokoppin Nature Reserve, N–S firetrack, 1.9 km S of Brown Rd, 24 Aug. 2000, *S.J. Patrick* 3755 & *L. Polomka* (PERTH); Durokoppin Nature Reserve, S side of main E–W firetrack through middle of reserve, *c.* 50 m E of Bencubbin–Kellerberrin road, 24 Aug. 2000, *S.J. Patrick* 3754 & *L. Polomka* (PERTH); NE corner of block loc. 19405, N side of Manmanning Rd, SW of Manmanning, 23 July 2001, *S.J. Patrick* 3921 & *L. Polomka* (PERTH); 27.3 km *c.* NE from Narembeen on Narembeen–Muntadgin road, 16 Oct. 1975, *G. Perry* 522 (PERTH); 2 km SW of Manmanning, 28 Aug. 1978, *B. & M. Smith s.n.* (PERTH); Durokoppin, 4 Sep. 1996, *B. H. Smith* 1862 (PERTH); 1 mile [1.6 km] SW of Manmanning, 29 July 1984, *B.H. Smith* 395 (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province of Western Australia. Extends from Manmanning south-east to near Varley, north of Lake King. The Varley collection is separated by a disjunction of about 130 km from the other collections, the closest of which is near Muntadgin. Often occurs in sandy soils over laterite but some records give the soil type as clay or loam, the vegetation commonly dominated by *Allocasuarina campestris*. (Figure 2A)

Flowering period. July to September.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Although its range is at least 300 km, this species is only known from a few localities in the central wheatbelt, an area that has been largely cleared.

Etymology. Named after F.L.E. Diels, a prominent botanist from Berlin, whose considerable contribution to Western Australian botany included the description of a number of new taxa in the Rhamnaceae (in Diels & Pritzel 1904).

Affinities. This extremely distinctive species has no very close relatives. The species with which it is most likely to be confused are *Cryptandra polyclada* and *C. spyridioides*, which overlap in range with it in Western Australia. The latter is readily distinguished by its 2-locular ovary and 2-lobed stigma. *Cryptandra polyclada* has a similar general appearance but differs in many respects including its shorter stipules, blunter and more erect leaf apex and less hairy flowers with more numerous floral bracts. *Cryptandra intonsa* has stipules and leaves of a similar shape to those of *C. dielsii* but is very different in other respects, for example in its much larger flowers.

Notes. This species was housed at PERTH as *Cryptandra dielsii* C.A. Gardner ms. until 1991 when the phrase name *Cryptandra* sp. Manmanning (*B.H. Smith* 395) was applied, and this was followed

by the use of the name *Stenanthemum dielsii* ms. in 1994. Confusion regarding the correct generic placement of *C. dielsii* resulted from its compact inflorescence surrounded by involucral bracts that superficially resemble those of some *Stenanthemum* species, particularly *S. humile* Benth. and *S. pumilum*. *Cryptandra dielsii* shows other parallels with those two species in having flowers with a long floral tube and conspicuously hairy sepals, but these characters may also be found in *Cryptandra* species such as *C. leucopogon*.

The involucral bracts in *C. dielsii* are formed from stipules modified into much enlarged structures connate for a long distance and with a reduced leaf borne at the summit. This is evidently a modification of the typical *Cryptandra* stipules, which are shortly connate to form a slight or definite lip to the outside of the leaf petiole but free to the inside of the leaf. In contrast in *Stenanthemum* the stipules are free to the outside of the leaf but are often connate for some distance to the inside of the leaf, so involucral bracts modified from these have the leaf borne at the base of the long-connate stipules as in *S. pumilum* and *S. humile*. Most species of *Stenanthemum*, however, have the involucral bracts further modified to resemble the floral bracts, without any obvious division into stipule and leaf components. Some *Spyridium* species such as *S. microcephalum* (Turcz.) Benth. tend to have the outer bracts more closely resembling those of *C. dielsii*, but differing in having the enlarged bases of the stipules separated by a hairy petiole-like structure with the reduced leaf borne at its summit.

Although atypical of *Cryptandra* in its inflorescence and prominent involucral bracts, *C. dielsii* appears to be typical of the genus in all other respects and is atypical of *Stenanthemum* in its stipules, leaves, disc and seed colouring. Molecular data (Kellermann *et al.* 2005) strongly support its placement in *Cryptandra* together with all species that have a hairy disc and stipules united outside the petioles. Its head-like inflorescence surrounded by involucral bracts could be a further modification from the head-like flower clusters in species such as *C. polyclada* and *C. spyridioides*, in which there are clearly a number of the uni-flowered multi-bracteate inflorescence units that are typical of *Cryptandra*. In *C. polyclada* the leaves and their associated stipules are arranged around each flower 'head' in the position of the involucral bracts of *C. dielsii* but are not modified, i.e. they are of the same form as the vegetative leaves and stipules.

However, in *Cryptandra dielsii*, each flower is usually subtended by one large bract and two small lateral bracts, probably representing the remnants of cymes and similar to those in many other genera such as *Spyridium* and *Stenanthemum*, so could represent the primitive arrangement of the flowers in *Cryptandra* prior to the development of the many-bracted flowers that typify *Cryptandra* (K. Thiele pers. comm.). On this basis, it could have closer affinities with the few other species that lack the typical *Cryptandra* inflorescence, i.e. with the *C. pungens* group or with the *C. intratropica* group.

15. Cryptandra exserta Rye, *sp. nov.*

Cryptandrae minutifoliae affinis sed foliorum puncto apicali magis erecto et floribus e bracteis involucralibus magis exsertis differt.

Typus: 0.5 km S of rail crossing, 41.5 km S of Norseman Post Office on Coolgardie–Esperance highway, Western Australia, 29 July 2001, *B. Archer* 1940 (*holo:* PERTH 06144411; *iso:* CANB, MEL, NSW all *n.v.*).

Shrubs c. 0.5 m high. *Branchlets* not obviously spinescent. *Young stems* with a dense matted indumentum at first of long very fine hairs, the individual hairs too tangled for their type (whether simple or stellate) to be readily determined but both stellate hairs and simple present, becoming glabrous. *Stipules* 0.6–1 mm long, acute to acuminate, ciliate. *Petioles c.* 0.3 mm long. *Leaf blades* narrowly oblong, 2.3–2.5 × 0.5–0.7 mm, with recurved to revolute margins completely or almost completely concealing the lower surface, tending to have acute tubercles on upper surface, lower surface white-hairy; mucro fairly erect, up to 0.2 mm long. *Bracts c.* 10, broadly ovate to oblong-elliptic, inner surface of outer bracts with long hairs along midvein; inner bracts c. 1.5 mm long, obtuse, densely ciliate; outer surface largely glabrous, with a few scattered minute stellate hairs towards the centre. *Flowers* usually 2–5 per branchlet in a terminal cluster, sometimes up to 10 in a spike-like group, white. *Floral tube* c. 2.5 mm long; adnate part of tube c. 0.5 mm long, densely minutely stellate-hairy, with a few long simple hairs towards the top; free part c. 2 mm long, rather densely hairy in distal half, becoming more sparsely hairy below, with a mixture of minute stellate hairs and longer simple hairs. *Sepals* 2–2.5 mm long, densely hairy with stellate and simple hairs, the latter hairs 0.4–0.6 mm long. *Petals c.* 1 mm long; claw *c.* 0.2 mm long. *Disc* with stellate hairs *c.* 0.3 mm long. *Ovary* 3-locular; summit with stellate hairs c. 0.35 mm long. *Style* 2–2.2 mm long, extreme base with stellate hairs; stigma 3-lobed. *Fruit* concealed within the floral tube, half-inferior, *c.* 3 mm long, densely minutely stellate-hairy on summit. *Seeds c.* 2.5 mm long, with a body *c.* 2 mm long and a 3-lobed aril *c.* 0.7 mm long.

Other specimen examined. WESTERN AUSTRALIA: in the SW corner of track junction of gridline and Mt Gibbs track, *c.* 900 m SSE of Hatter Hill, 4 Sep. 1996, *N. Gibson & K. Brown* 2983 (PERTH).

Distribution and habitat. Distributed close to, and on both sides of, the border between the South West Botanical Province and the South Western Interzone of Western Australia in the region from Hatter Hill east to between Norseman and Kumarl. One record is from sandy soil with lateritic gravel and rocks in mallee-dominated vegetation, while the other record is from red sand over clay in vegetation with *Acacia*, *Allocasuarina* and *Santalum*. (Figure 6A)

Flowering period. July to September.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. The distance between the two known localities of this taxon is *c.* 160 km. The area is poorly known botanically; with further survey more populations of *C. exserta* are likely to be found.

Etymology. From the Latin word *exsertus* – protruding, as the flowers protrude far out of the involucre of bracts.

Affinities. This taxon is either part of or closely related to the *Cryptandra minutifolia* complex. It has some of the characteristics of *C. wilsonii* Rye, differing in its petioles tending to be hidden within the stipule pair and its larger flowers, suggesting the possibility that it is of hybrid origin between the *C. minutifolia* complex and *C. wilsonii*.

Notes. Previously housed at PERTH as *Cryptandra* sp. Norseman (*B. Archer* 1940), this species is very poorly known. The description of the fruit is based on a single old fruit with one seed inside. Better fruiting collections are needed.

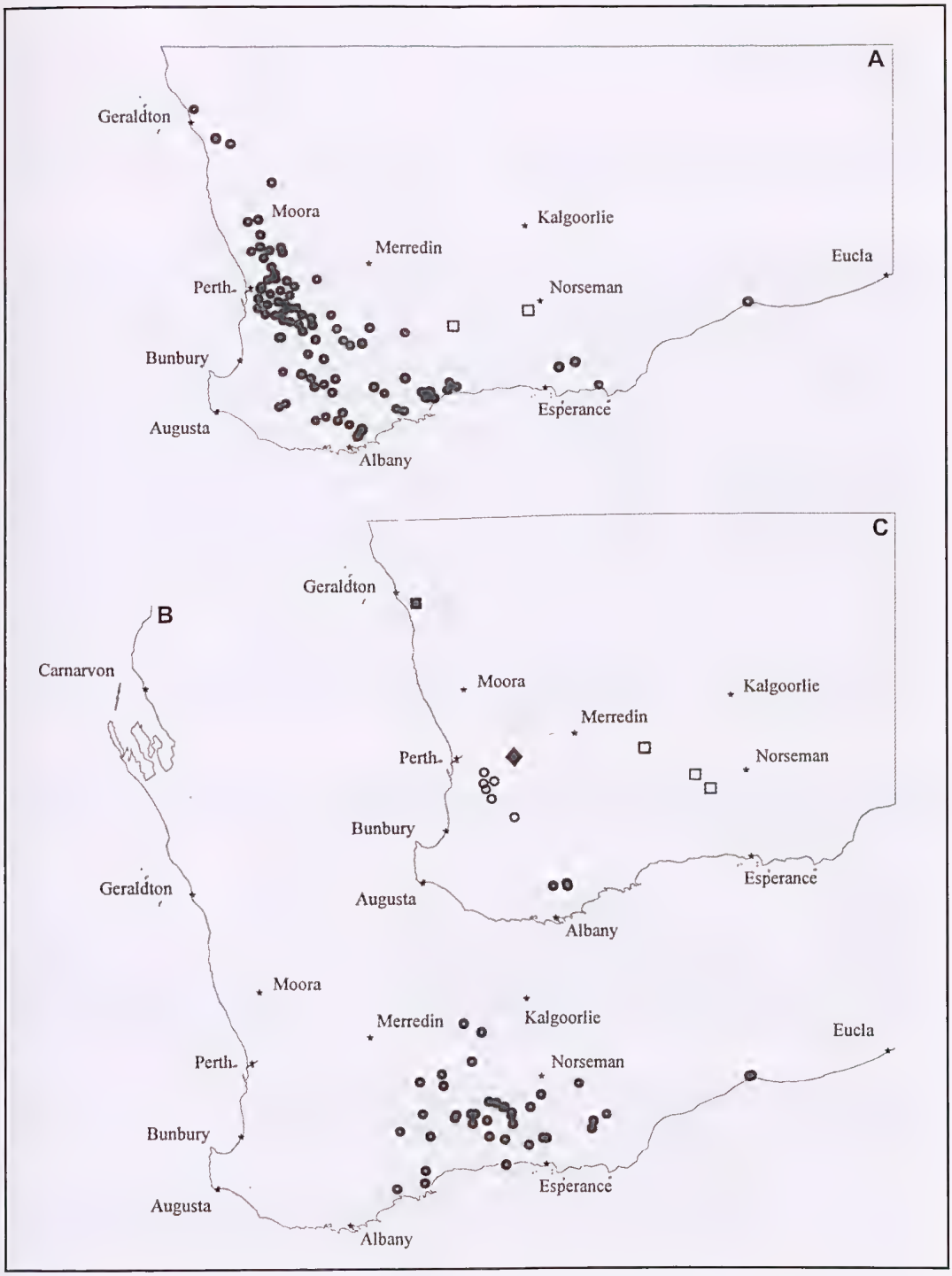

Figure 6. Geographic distributions. A – *Cryptandra nutans* Steud. ● and *C. exserta* □; B – *Cryptandra recurva* Rye; C – *Stenanthemum bremerense* □, *S. pumilum* subsp. *majus* ○, *S. pumilum* subsp. *pumilum* ●, *S. radiatum* □ and *S. yorkense* ♦.

16. Cryptandra inconspicua Rye, *sp. nov.*

Cryptandrae pungens affine sed ramulis non spinescentibus, pedicellis brevioribus, disco glabro differt.

Typus: Between Pingrup and Lake Grace, Western Australia, 21 September 1933, *W.E. Blackall* 3049 (*holo:* PERTH 01516418; *iso:* CANB, MEL, PERTH 01516426).

Shrub spreading, sometimes semi-prostrate, 0.1–0.2 m high. *Branchlets* not spinescent. *Young stems* with simple patent hairs 0.1–0.25 mm long. *Stipules* 0.7–1.5 mm long, acute to long-acuminate, usually with a few hairs scattered along midvein and a few cilia. *Petioles* 0.3–0.4 mm long. *Leaf blades* narrowly elliptic to obovate, 2–3.7 × 0.7–1.5 mm, usually obtuse; lower surface often concealed by leaf margins, densely hairy; upper surface with simple patent hairs 0.1–0.2 mm long. *Bracts* 2–4 per flower, ovate, 0.5–0.7 mm long, acute, prominently ciliate, the largest cilia *c.* 0.2 mm long; outer surface often hairy along the midvein or sparsely hairy in distal half. *Pedicels c.* 0.4 mm long. *Flowers* usually 3–8 per branchlet, in a head-like cluster 2–3.5 mm wide, white. *Floral tube c.* 0.9 mm long (not seen in fruit), with stellate hairs and simple hairs of a similar size to those on the sepals; adnate part of tube *c.* 0.5 mm long, very densely hairy; free part of tube *c.* 0.4 mm long, moderately densely hairy. *Sepals* 0.5–0.6 mm long, moderately densely hairy with stellate and simple hairs 0.1–0.2 mm long. *Petals c.* 0.3 mm long; claw *c.* 0.1 mm long. *Disc* glabrous. *Ovary* 3-locular; summit with hairs *c.* 0.2 mm long. *Style* 0.3–0.4 mm long; stigma 3-lobed. *Fruit* unknown. (Figure 3H–L)

Other specimens examined. WESTERN AUSTRALIA: no locality or date, *Anon.* Herb. C.A. Gardner 1743 (PERTH); Wishbone, Sep. 1926, *C.A. Gardner & W.E. Blackall s.n.* (PERTH); near junction of Fitzgerald River National Park and Susetta River, 13 July 1970, *A.S. George s.n.* (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province of Western Australia, recorded from Wishbone (near Dumbleyung), from between Pingrup and Lake Grace and from Fitzgerald River National Park. Habitat unknown. (Figure 4C)

Flowering period. July to October.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. There are four collections recorded from localities over a range of *c.* 170 km. The most recent collection, made in 1970, is from a large national park. As this species is relatively inconspicuous, it may prove to be poorly collected rather than genuinely rare, but the lack of recent collections is a concern.

Etymology. From the Latin *inconspicuus* – not readily visible, referring to the likelihood of these small plants, with their tiny leaves and flowers, being overlooked.

Affinities. This new species apparently belongs to the small group of species that would be placed in subg. *Corisandra* if that group were still recognised. It is like *Cryptandra mutila* and *C. pungens* in its few floral bracts and inflorescence type, but those two species have longer, more obvious pedicels and a hairy disc. *Cryptandra mutila* also differs in having glabrous flowers, and usually has a bilocular ovary and two stigmatic lobes, while *C. pungens* differs in having spinescent branchlets.

Notes. Fruiting material of the new species is needed to complete the description of this poorly known species.

17. Cryptandra micrantha Rye, *sp. nov.*

Ramuli spinescenti; flores sessiles vel subsessiles, minuti, plerumque perfecte glabri; ovarium uniloculare; stigma integrum; fructus magnopere inferiore.

Typus: 700 m north-east of Mt Gibson, Western Australia, 15 July 1994, *S.J. Patrick* 1855 (*holo:* PERTH 04159950; *iso:* CANB).

Shrubs rounded or low and spreading, commonly 0.3–0.6 m high. *Branchlets* spinescent. *Young stems* with simple appressed hairs or glabrous, the longer hairs 0.5–0.6 mm long. *Stipules* 0.6–1.3 mm long, acute to long-acuminate, ciliate. *Petioles* protruding from the connate base of the stipule pair, 0.3–0.4 mm long, glabrous. *Leaf blades* narrowly oblong to elliptic, 1.3–2.3 × 0.4–0.7 mm, entire, with recurved to revolute margins partially to completely concealing the lower surface, usually obtuse; lower surface glabrous to densely hairy but hairs often concealed; upper surface glabrous, green. *Bracts* 4–6, ovate, 0.4–0.8 mm long, acute, ciliate, the cilia 0.1–0.15 mm long; outer surface often hairy along the midvein. *Flowers* few to numerous per branchlet in several dense clusters 1.5–3 mm wide, white or cream. *Floral tube* 0.8–1.0 mm long (enlarging to 1.7–2.2 mm in fruit); adnate part of tube *c.* 0.5 mm long, glabrous throughout or rarely with a few stellate hairs *c.* 0.1 m long; free part of tube 0.3–0.45 mm long, glabrous. *Sepals* 0.6–0.7 mm long, glabrous. *Petals* 0.4–0.5 mm long; claw *c.* 0.1 mm long. *Disc* densely stellate-hairy or glabrous; hairs 0.1–0.2 mm long. *Ovary* 1-locular. *Style* *c.* 0.25 mm long; stigma not lobed. *Fruit* apparently indehiscent, largely inferior (*c.* three-quarters inferior), *c.* 2.0 × 1.2 mm; superior part enclosed by free floral tube and sepals, sparsely stellate-hairy on summit, the disc forming a very prominent, usually densely stellate-hairy rim around the sparsely stellate-hairy summit. *Seeds c.* 1.4 × 1 mm, much compressed, base colour not recorded, medium brown above; aril very reduced, scarcely lobed. (Figure 5F–I)

Selected specimens examined. WESTERN AUSTRALIA: 8 miles [13 km] N of Wialki, 16 July 1967, *J.S. Beard* 4722 (PERTH); Blue Hills, Karara Station, 29°09'S, 116°53'E, 21 Oct. 2003, *E.M. Bennett s.n.* (PERTH); Mt Gibson, *c.* 1 km NE of homestead, 3 June 1984, *D.G. Fell* 0213 (PERTH); near Jibberding, 9 July 1931, *C.A. Gardner & W.E. Blackall* 20 (PERTH); Fowlers Gully, Wongan Hills, 20 July 1974, *K.F. Kenneally* 1836 (PERTH); Mt Singleton, 24 Aug. 1965, *K.R. Newbey* 2012 (PERTH); 20 km W of Boorabbin, 26 July 1981, *K.R. Newbey* 8363 (PERTH); 8.3 km NNE of landing ground on Warriedar Coppermine road, 17 July 1994, *S.J. Patrick* 1881 (PERTH); 17 km SE of Tardun, 22 July 1994, *S.J. Patrick* 1912, 1913 (PERTH); 5 km SW of Paynes Find, 24 June 1995, *S.J. Patrick* 2291 (PERTH); Mt Singleton, 21 Aug. 1985, *B.H. Smith* 615 (PERTH); Mt Singleton, 6 Aug. 1969, *P.G. Wilson* 8617 (PERTH).

Distribution and habitat. Endemic to the south-west of Western Australia. Extends from near Canna south to Wongan Hills in the South West Botanical Province, south-west to near Boorabbin South Western Interzone and east to Kirkalocka Station (south of Mount Magnet) in the Eremaean Botanical Province. Recorded from stony sites with red or brown clayey soil and from deep yellow sand. Commonly occurs in hilly areas with rock substrates of volcanic origin, and also known from granitic and lateritic sites. (Figure 2C)

Flowering period. July to August.

Conservation status. Known from about ten localities over a range of *c.* 370 km, including a national park. The species was abundant at three northern populations surveyed in 1992–1994 by Sue Patrick (pers. comm.).

Etymology. From the Greek *mikros* – small and *anthos* – flower, as this species has the smallest flowers in its genus.

Affinities. This species is very distinctive and does not appear to have any close relatives. Its normally 1-ovulate unilocular ovary is unique in *Cryptandra* and unknown in all other south-western Australian genera of Rhamnaceae, although one species of *Trymalium* that has a 3-locular ovary aborts two loculi as the fruit develops and so is like *C. micrantha* in producing a unilocular 1-seeded fruit (Rye 2000). Most species of *Cryptandra* have a 3-locular ovary, but there are four species that are usually or always 2-locular. These 2-locular species all appear to have close relatives that are 3-locular and show no close relationship to the unilocular *C. micrantha*, so it appears that, several independent lineages showing reduction in the number of ovary chambers have occurred within the genus *Cryptandra*.

The one-chambered fruit of *C. micrantha* has not been seen at maturity but appears to be indehiscent or at least shed intact, with the casing soft and flexible rather than brittle. There is usually a solitary seed, but one 2-seeded fruit has been observed. *Cryptandra micrantha* has an exceptionally small aril on the very compressed seed body, the aril slightly lobed but not obviously 3-lobed as in most *Cryptandra* species, which have a moderately large aril. The reduced aril resembles that of *Spyridium* and *Trymalium* species, which have indehiscent fruitlets and therefore do not rely on the aril for their dispersal.

Notes. Cryptandra micrantha is a quite variable species. Two specimens collected from Wongan Hills are unusual in having a glabrous disc (Figure 6I). They are not unique in this respect, however, as there is also a specimen from near Tardun with the disc glabrous (J. Kellermann pers. comm.). There is also considerable variation elsewhere, for example with northern specimens of *C. micrantha* tending to have glabrous stems and leaves. Flowers are occasionally 4-merous.

18. Cryptandra multispina Rye, *nom et stat. nov.*

Cryptandra scoparia var. *microcephala* Benth., Fl. Austral. 1: 439 (1863). *Type:* Murchison River, Western Australia, *A. Oldfield s.n.* (*holo:* K, *n.v.*, scan seen; *iso:* MEL 227043).

Illustration. Rye (1995b: fig. 5K–N).

Selected specimens examined. WESTERN AUSTRALIA: 1.9 km N of Greenough River on W (central) boundary of East Yuna Nature Reserve, 15 Nov. 1997, *P.G. Armstrong s.n.* (PERTH); Kalbarri National Park, 100 m S of crossroads on E side of firebreak, 12 km E of South Dam, 6 Sep. 1990, *A.H. Burbidge* 4359 (PERTH); Cooloomia Nature Reserve, 3 Aug. 1996, *G.J. Keighery & N. Gibson* 2069 (PERTH); on E side of railway line, 2.3 km S of Garranya Rd, Marchagee Nature Reserve, 17 Apr. 2000, *G.J. Keighery & N. Gibson* 5029 (PERTH); between Moore and Murchison Rivers, June 1901, *E. Pritzel* 377 (PERTH).

Distribution and habitat. Occurs in the north of the South West Botanical Province of Western Australia, extending from near Shark Bay south-east to Marchagee. (Figure 7B)

Flowering period. June to September.

Etymology. From the Latin *multi* – many and *spina* – thorn, referring to the numerous spinescent branchlets occurring along the young stems of this species.

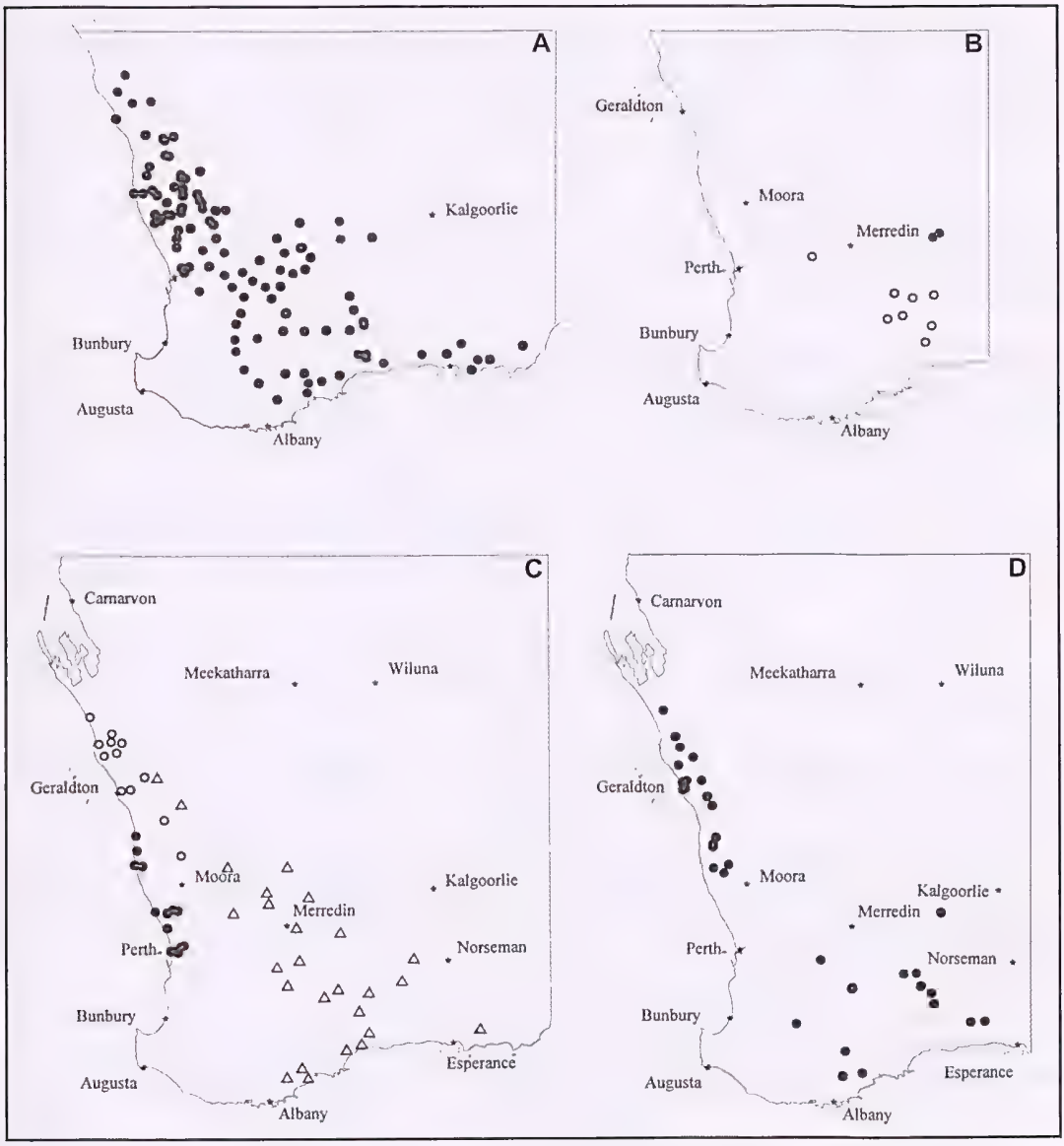

Figure 7. Geographic distributions. A – *C. myriantha* Diels; B – *Cryptandra polyclada* subsp. *aequabilis* Rye • and *C. polyclada* Diels subsp. *polyclada* ○; C – *Cryptandra multispina* ○, *C. scoparia* • and *C. wilsonii* Rye △ ; D – *C. spyridioides* F. Muell.

Conservation status. Once classed as a Priority Two taxon, this species is now better collected over a much wider range and is no longer considered to be at risk.

Affinities. Quite clearly the closest relative of this taxon is *Cryptandra scoparia*, but there are significant vegetative differences and also minor floral differences between the two species.

Cryptandra multispina is one of the few Western Australian members of the genus to be consistently spinescent. Its young stems have numerous and fairly equidistant lateral spinescent branchlets. On young stems these spinescent branchlets are only 5–7 mm long and have a maximum of one node, but on lower stems they may become somewhat longer and have more than one node. In contrast

Cryptandra scoparia lacks spinescence in some specimens and is often less consistent when spinescent lateral branchlets are present. Its spinescent branchlets are longer than in *C. multispina* and have 1–4 nodes. There is also a difference between the two taxa in their young bark as *C. multispina* has pale glabrous or glabrescent bark peeling in broad strips from the young stems whereas *C. scoparia* has hairy dark bark remaining attached for longer and then peeling in narrow strips and patches.

In *Cryptandra scoparia* the petioles tend to be hidden by the stipules or only shortly exserted whereas, in *C. multispina*, the petioles are very obvious and always well exserted from the stipules. Leaf blades tend to be longer in *C. scoparia* and they are sometimes hairy whereas they are consistently glabrous in *C. multispina*.

Differences in the floral morphology of the two taxa are less obvious but the sepals tend to have coarser hairs forming more obvious apical tufts in *C. multispina* than in *C. scoparia*.

Notes. This species has been known by the informal name *Cryptandra* sp. Kalbarri (*A.S. George* 2364), although it has more commonly been regarded as a variety of *C. scoparia*. A new name is required for the taxon, rather than just a recombination, as the varietal epithet has already been used at the species level in the name *Cryptandra microcephala* Turcz. , which is the basionym for *Spyridium microcephalum* (Turcz.) Benth.

18. Cryptandra mutila Nees ex Reissek *in* J.G.C. Lehmann, Pl. Preiss. 2: 289–290 (1848). *Type:* Woodman Point, Perth, Western Australia, 17 August 1839, *L. Preiss* 1229 (*syn:* LD).

Selected specimens examined. WESTERN AUSTRALIA: E of Hutt River estuary, Lynton Station, Port Gregory, 1999, *J. Brooker* L58 (PERTH); Sep. 1903, *W.V. Fitzgerald s.n.* (PERTH ex NSW).

Notes. Of particular interest is an old collection (*W.V. Fitzgerald* Sep. 1903) that has evidence of adventitious roots and multiple shoots along a horizontal underground stem. This unusual habit may be related to the coastal distribution of *Cryptandra mutila*, as many coastal taxa are adapted to cope with shifting sand dunes.

Most specimens of *Cryptandra mutila* have all or most of their flowers with a 2-locular ovary and a 2-lobed stigma. Occasional specimens with mostly 3-locular ovaries are now known, one of which was briefly housed under the phrase name *Cryptandra* sp. Port Gregory (J. Brooker L58).

Stenanthemum Reissek

For synonyms, a description of this genus and distribution maps of most species see Rye (2001).

Size and distribution. A genus of at least 30 species, occurring mainly in central and southern Australia, particularly in Western Australia where there are 26 species currently recognised, but also represented by one species in northern Queensland. A key to the species of *Stenanthemum* occurring outside Western Australian is given in Thiele (2007). The Western Australian species are endemic except for *S. notiale*, which also occurs in South Australia and Victoria, and *S. petraeum*, which extends into Northern Territory.

As noted earlier, the presence of a thick annular disc in *Stenanthemum sublineare* distinguishes this species from the remainder of the species of *Stenanthemum* and its generic placement has therefore

been questioned. However, a preliminary ITS sequence analysis indicates that this species does belong in *Stenanthemum* and that it is closely related to *S. humile* and *S. reissekii* Rye (J. Kellermann pers comm.). Further molecular sequencing will be carried out to test this placement. Recent collections of *Stenanthemum sublineare* have extended its range down the west coast to Augusta and along the south coast to the Manypeaks area. Southern collections show some morphological differences which suggest that they need to be recognised formally, probably at the subspecific level, but this will be dealt with in a separate paper.

Key to Western Australian species and subspecies of *Stenanthemum*

To accommodate the new taxa, five new pairs of couplets have been added to the key to species given previously (Rye 2001) for *Stenanthemum*. A couplet has also been removed to delete the anomalous species *Stenanthemum sublineare*, which is keyed separately in the generic key.

1. Floral tube (in flower) 0.6–1.3 mm long; free part 0.3–0.8 mm long, shorter than or about as long as the sepals

2. Stipules free or connate for less than a quarter of their length

3. Leaves with prominently recurved margins

4. Leaves prominently 2-lobed at apex; upper surface densely hairy. Bracts whitish. Floral tube *c.* 0.7 mm long, enlarging to *c.* 1.7 mm long in fruit. (Mullewa area) ..... **S. bilobum**

4. Leaves rounded or slightly lobed at apex; upper surface with minute broad protusions. Bracts brown. Floral tube *c.* 1.2 mm long, enlarging to *c.* 2.8 mm long in fruit. (Forrestania area) ..... **S. liberum**

3. Leaves with margins more or less flat or incurved

5. Leaves minutely stellate-hairy on upper surface. Ovary summit glabrous. Fruit with long deciduous simple hairs, becoming glabrous. (Adelong Station to Kulin to Norseman) ..... **S. stipulosum**

5. Leaves with minute patent simple hairs on upper surface. Ovary summit densely hairy. Fruit hairy, usually densely so, with long simple hairs and short stellate hairs, sometimes becoming almost glabrous. (Dirk Hartog Island to Mullewa)..... **S. complicatum**

2. Stipules connate for one-third to over half of their length

6. Floral tube (in flower) with the longest hairs 0.8–1.2 mm long. Sepals with hairs extending c. 0.5 mm beyond the apex

7. Leaves 5–8 mm long; upper surface with simple patent hairs 0.3–0.4 mm long. (Fitzgerald River National Park)..... **S. cristatum**

7. Leaves 8–14 mm long; upper surface tuberculate. (E of Walkaway)..... **6. S. radiatum**

6. Floral tube (in flower) with the longest hairs 0.3–0.5 mm long. Sepals with hairs extending 0.1–0.3 mm beyond the apex

8. Leaves narrowly obtriangular or rarely triangular, the apex emarginate between 2 prominent acute lobes, with minute broad protrusions on upper surface; lower surface with long antrorse simple hairs tending to obscure the stellate ones. (Gunyidi to Stirling Range and Fitzgerald River National Park)..... **S. emarginatum**

8. Leaves narrowly to broadly obovate to obcordate, entire or with 1 or more teeth on each side of apex or with 2 prominent obtuse lobes, either hairy on upper surface or with stellate hairs on lower surface not hidden

9. Floral tube densely hairy in the lower half and usually throughout. Fruit with a dense covering of short stellate hairs combined with scattered long antrorse hairs, sometimes becoming almost glabrous when very old

10. Leaves with 1–3 or more teeth on each side of apical point; upper surface glabrous, with minute to short broad protrusions or minute patent to widely antrorse simple hairs

11. Leaves 2–8 mm long, the margins flat or recurved; upper surface with minute to small simple hairs, sometimes becoming glabrous. Occurring in inland and near-coastal locations, in sandy or clayey soils, sometimes with laterite or granite. (Kalbarri to Mt Ridley)..... **S. intricatum**

11. Leaves 5–15 mm long, the margins recurved; upper surface with minute broad protrusions or rarely with minute simple hairs. Occurring in coastal limestone areas. (Jurien to Perth)..... **S. notiale** subsp. **chamelum**

10. Leaves usually entire, rarely with 1 or 2 teeth on each side of apical point; upper surface usually densely covered by stellate hairs and/or long simple antrorse or appressed hairs, rarely moderately densely hairy (Kalbarri to Stirling Range and Cocklebiddy, also South Australia and Victoria)..... **S. notiale** subsp. **notiale**

9. Floral tube almost glabrous to moderately densely hairy in lower part. Fruit rather to very sparsely hairy, either with scattered stellate hairs only or with simple hairs, which are often mixed with a few large stellate hairs

12. Branchlets not spinescent. Leaves with 1 or 2 prominent teeth on each side of apex. Lower floral tube sparsely hairy or glabrous. Fruit largely glabrous but with scattered stellate hairs. (Gunyidi to West River) ..... **S. tridentatum**

12. Branchlets often spinescent. Leaves with 2 obtuse lobes (the apical point recurved). Floral tube moderately densely hairy. Fruit with a rather sparse indumentum of long simple hairs and often also a few stellate hairs. (Quobba Station to Kalbarri) ..... **S. divaricatum**

1. Floral tube (in flower) 1.5–6 mm long; free part 0.9–5 mm long, longer than the sepals

13. Disc apparently absent. Leaves entire

14. Sepals with a very dense white indumentum of long curled or crisped patent hairs 0.5–1.3 mm long

15. Leaves narrowly obovate to linear, with revolute margins somewhat separated or meeting below. (Eneabba to Perth)..... **S. humile**

15. Leaves narrowly to broadly obovate, obtriangular or obcordate, conduplicate at first, the margins not recurved or, if so, then widely separated below

16. Leaves 4–14 mm long, opening at centre and sometimes base but remaining closed at apex; upper surface greyish, densely covered with patent simple hairs at first, retaining hairs near midvein and often staying hairy all over. Stipule pairs directly below inflorescence and involucral bracts with two narrow points separated by a sinus

17. Leaves 7.5–14 mm long. Floral tube (in flower) 2.5–3.5 mm long. (Darling Range near Perth to Highbury) ..... **5b. S. pumilum** subsp. **majus**

17. Leaves 4–7 mm long. Floral tube (in flower) 2–2.3 mm long. (Stirling Range) ..... **5a. S. pumilum** subsp. **pumilum**

16. Leaves 8–17 mm long, opening fully; upper surface bright green, glabrous or with a few hairs along midvein. Stipule pairs directly below inflorescence and involucral bracts with 2 points tapering from a broad base rather than narrow throughout (York area)..... **7. S. yorkense**

14. Sepals with appressed or antrorse hairs 0.3–0.5 mm long

18. Leaves 2.5–7 × 2.5–6 mm, with 2 or 3 relatively inconspicuous lateral veins on each side of midvein

19. Leaves minutely stellate-hairy on upper surface (Wilroy to Perenjori and Blue Hill Range area)..... **S. poicilum**

19. Leaves smooth or with minute broad protrusions on upper surface. (Marvel Loch to Bremer Range) ..... **1. S. bremerense**

18. Leaves 8–23 × 5–12 mm, with 5–8 prominent lateral veins on each side of midvein. (Kalbarri to Yorkrakine)..... **S. pomaderroides**

13. Disc lining floral tube, with u- or v-shaped sinuses between the stamen traces. Leaves entire to prominently laterally toothed at the apex or emarginate

20. Leaves with upper surface minutely stellate-hairy; petiole 1–5 mm long (Weld Range to North Leonora area)..... **4. S. patens**

20. Leaves with upper surface glabrous, with minute broad protrusions or with simple hairs; petiole 0.5–2.5 mm long

21. Stipules free or connate for less than one quarter of their length. Disc with shallow u-shaped sinuses between the stamen traces

22. Leaves with minute simple patent hairs on upper surface. Ovary glabrous. (Die Hardy Range to Koolyanobbing) ..... **3. S. newbeyi**

22. Leaves minutely tuberculate on upper surface, sometimes also with a few long appressed hairs. Ovary summit densely hairy. (Mt Augustus to Northern Territory)..... **S. petraeum**

21. Stipules connate for one quarter to half their length. Disc with fairly deep v-shaped sinuses between the stamen traces

23. Leaves narrowly obovate, entire, obtuse, without a definite apical point. (Badgingarra area)..... **S. reissekii**

23. Leaves obovate or obtriangular to circular, in most taxa laterally toothed at the apex or emarginate, with a recurved to erect apical point, if leaves entire then occurring in arid zone

24. Leaves with apex and margins entire. Occurring in the Eremaean Botanical Province. (Yeelirrie and Black Hill Stations.) ..... **S. mediale**

24. Leaves with apex emarginate or with 1 or more small teeth on each side of apex. Occurring in the South West Botanical Province

25. Bracts ovate or broadly ovate. Floral tube 1.5–1.8 mm long in flower, enlarging to 3–3.5 mm in fruit. (Darling Range.)..... **S. nanum**

25. Bracts subulate to narrowly triangular. Floral tube 2.5–3.5 mm long in flower, either not distinctly enlarging (*S. coronatum*) or enlarging to 5–6 mm in fruit

26. Outer bracts 2.5–3 mm long. Free part of floral tube densely stellate-hairy (and with simple hairs) not greatly contrasting

with the very densely hairy adnate part. Ovary summit glabrous. (Bindoon to Darkan)..... **2. S. coronatum**

26. Outer bracts 1.5–2 mm long. Free part of floral tube rather sparsely stellate-hairy (and with a few long simple hairs) in marked contrast to the very densely hairy adnate part. Ovary summit with hairs *c.* 0.2 mm long. (Mt Lesueur area)..... **S. limitatum**

1. Stenanthemum bremerense Rye, *sp. nov.*

Stenanthemo poicilo arcte affine sed foliis supra glabratis et plerumque sepalis longioribus magis recurvatis differt.

Typus: Bremer Range, 7 km south of Lake Medcalf, Western Australia, 27 May 2004, *G.F. Craig* 6117 (*holo:* PERTH 06829805; *iso:* CANB).

Shrubs erect or low and spreading, usually (0.2)0.3–0.6 m high, reportedly up to 1.4 m high, single-stemmed at base, sometimes becoming multi-branched at base. *Young stems* with a dense ferruginous indumentum at first of stellate hairs and larger antrorse to patent simple hairs 0.5–0.8 mm long, becoming glabrous. *Stipules* free or connate at base for up to *c.* one-quarter of their length, 2.7–4 mm long, acuminate, with denticulate margins, dark red-brown, becoming black with age; outer surface sometimes denticulate along midrib, with a few short simple hairs or glabrous; inner surface often hairy along midvein. *Petioles* 1–2.5 mm long, densely hairy on undersurface, glabrous on upper surface. *Leaf blades* conduplicate at first, broadly obovate, 3–9 × 2.5–5 mm, entire, with more or less flat margins, with a recurved apical glabrous point 0.3–0.4 mm long; lower surface with 2–4 main lateral veins on each side of midvein, minutely stellate-hairy and with antrorse simple hairs 0.5–0.8 mm long, some of the hairs ferruginous especially along the margin and veins; upper surface smooth or with minute broad protrusions at maturity. *Flower clusters* few- to many-flowered, 5–12 mm diam., white. *Floral tube* 2.5–4 mm long (enlarging to 4–5.5 mm in fruit); adnate part of tube *c.* 0.8 mm long, very densely hairy; free part up to 3 mm long, moderately densely hairy, with appressed simple hairs 0.4–0.7 mm long. *Sepals* 1.5–2 mm long, widely spreading and recurved, with appressed or antrorse simple hairs 0.3–0.5 mm long outside. *Petals* 0.6–0.9 mm long, shortly clawed. *Disc* apparently absent. *Ovary* with summit glabrous. *Style* up to 3.5 mm long. *Fruit c.* 2.5 mm long, hairy. *Seeds c.* 1.7 mm long; body *c.* 1.4 × 1 mm, off-white with a black base and distinctly mottled with brown markings above; aril c. 1 mm long, clear-translucent, 3-lobed.

Selected specimens examined. WESTERN AUSTRALIA: *c.* 0.8 km WSW of Windy Hill Camp access track turnoff, which is 158 km W of Hyden on Hyden–Norseman road, 32°13'S, 120°30'E, 16 June 2002, *P. Armstrong s.n.* (PERTH); Bremer Range, 6.4 km E of Maggie Hays–Ninety Mile Tanks track, on track to Lake Medcalf, 12 Oct. 2003, *G.F. Craig* 5918 (PERTH); Bremer Range, 2 km SSE of Mt Glasse, 7 Nov. 2003, *G.F. Craig* 5976 (PERTH); Windy Hill camp (Emily Ann and Maggie Hays mines), 75 km E of Forrestania Crossroads on Hyden–Norseman road then S of road for *c.* 3 km, 23 June 2005, *G.F. Craig* 6577 (PERTH); Maggie Hays Hill, 32°17'S, 120°35'E, 8 May 1978, *G.J. Keighery* 1687 (PERTH); Marvel Loch Sons of Gwalia Mine, 14 Oct. 2003, *V. Yeomans* A8 (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province of Western Australia, known from many collections in the Bremer Range area and also from a single isolated atypical collection from near Marvel Loch. Occurs on the top or sides of laterite outcrops and breakaways and in other

sites with lateritic gravel or pebbles, often in areas with *Allocasuarina* and/or *Melaleuca* species dominant. (Figure 6C)

Flowering period. Mainly recorded April to June, also recorded in October and November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. *Stenanthemum bremerense* is common at some localities, with one population having thousands of plants. Its main range seems small but is extended to *c.* 170 km if the atypical specimen is included.

Etymology. Named after Bremer Range as the species occurs mainly in the area near that range.

Affinities. One specimen (*G.J. Keighery* 1687) was previously listed under its very close relative *S. poicilum* Rye when that species was described (Rye 1995). *Stenanthemum bremerense* is geographically separated from *S. poicilum* by at least 350 km and differs in having the upper surface of its leaves smooth or with minute broad protrusions at maturity. It also tends to be a larger plant with longer petioles, leaf blades and sepals. There may be a tendency for the two taxa to flower at different times of the year as the main flowering period recorded for *S. poicilum* so far is from October to December whereas *S. bremerense* has mainly been recorded in flower from April to June.

Notes. This species was previously known as *Stenanthemum* sp. Bremer Range (*G.J. Keighery* 1687). An isolated collection from the Marvel Loch area (*V. Yeomans* A8) seems somewhat atypical in having small leaves and possibly fewer flowers than usual. This variant needs further collection to see whether it differs consistently in any characters and, if so, its status should be reviewed.

2. Stenanthemum coronatum (Reissek) Reissek, *Linnaea* 29: 295 (1858). *Type:* south-western Australia [between Wongan Hills and Augusta, Western Australia], 1842–1843, *J. Drummond* coll. 2: 722 (*iso:* MEL 227036).

Selected specimens examined. WESTERN AUSTRALIA: 11.5 km S of Cachionalgo Hill, off Bindoon–Dewars Pool road, 31°23'S, 116°17'E, 7 Nov. 1996, *M.G. Allen* 246 (PERTH); Bindoon Army Training Area 6 km S of NW corner at W boundary at Sneakers Range, 31°12'S, 116°18'E, 11 Nov. 2002, *F. Hort* 1900 (PERTH); Woondowing Nature Reserve, Jarrah Rd, Wundowie, 5 Nov. 2004, *F. Hort* 2418 *& B. Hort* (PERTH); Julimar Proposed Conservation Park, Beard Rd, Toodyay, 6 Nov. 2005, *F. Hort* 2684 *& J. Hort* (PERTH); Dewars Pool Rd, *c.* 9.4 km E of intersection with Toodyay–Bindi Nindi road, Sep. 2000, *B. Morgan* 9 (PERTH).

Notes. The known range of this species has been extended north to the Bindoon Army Training Area. Populations in the Bindoon area (two cited above being *M.G. Allen* 246 and *F. Hort* 1900), tend to have coarser and/or longer hairs on the upper surface of the leaves than specimens occurring from Toodyay south to the Bowelling area (between Collie and Darkin), but this slight difference in indumentum is not sufficiently well defined to suggest that the northern variant should be recognised formally.

Mature fruits are more or less globular, the floral tube circumscissile at the top of the fruit, 2–2.3 mm long, sparsely covered by minute stellate hairs and much longer simple hairs. Seeds are 1.5–1.7 mm long, with a seed body 1.4–1.5 × 0.8–1 mm and a prominently 3-lobed clear-translucent aril 0.7–0.9 mm long. The testa has a black base and is distinctly mottled above with red-brown patches over a straw-coloured background.

3. Stenanthemum newbeyi Rye, *Nuytsia* 10: 293–295 (1995). *Type:* Bungalbin Hill, Western Australia, 2 January 1989, *D.J. Pearson* 559 (*holo:* PERTH 01679538).

Selected specimens examined. WESTERN AUSTRALIA: Helena and Aurora Range, *c.* 50 km NNE of Koolyanobbing, 8 Oct. 2004, *V. Clarke* 501 (PERTH); *c.* 12.5 km NE of Barcooting Hill, Ennuin Station, 18 Oct. 1996, *N. Gibson & M.N. Lyons* 2735 (PERTH).

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. Many new collections of this species have extended its known range north to Die Hardy Range, south to Koolyanobbing and west to Ennuin Station. Although many more populations are now known over a distance of *c.* 70 km, many of them are in areas where mining is proposed.

Notes. New fruiting collections, including two cited above, are the first to contain mature seeds. The fruits (excluding attached floral parts) are 2.6–3 mm long, with seeds 2–2.4 mm long. Seeds have a darkly mottled (with dark patches covering much more of the surface than the pale patches) or sometimes completely dark body 1.4–1.7 × 0.8–1.2 mm and a prominently 3-lobed whitish to cream- or clear-translucent aril 0.8–1.2 mm long, with the lateral lobes as long as or longer than the central lobe.

4. Stenanthemum patens Rye, *Nuytsia* 13: 503–505 (2001). *Type:* between Teutonic and Mt Clifford [precise locality withheld], Western Australia, 16 August 1981, *R. Cumming* 1267 (*holo:* PERTH 02937786; *iso:* CANB).

Selected specimens examined. WESTERN AUSTRALIA: Weld Range, NW of Cue, 31 Aug. 2005, *Markey & Dillon* 3094, 3095 (PERTH).

Conservation status. Conservation Codes for Western Australian Flora: Priority One. A new collection of this species from Weld Range has extended its known range westwards by almost 400 km. However, this small new population is in an area marked for roadworks and drill sampling and is expected to be destroyed when this mining survey work is completed. Further populations of the species would probably be discovered if rocky habitats in the intermediate area between the two known locations could be thoroughly surveyed.

Notes. The new material of this species is the first to contain mature seeds. The seeds are *c.* 2.8 mm long with a darkly mottled body *c.* 2.4 × 1.6 mm and a prominently 3-lobed white-translucent aril *c.* 1.7 mm long. One of the plants sampled from this new population had large leaves with a petiole 4–5 mm long and a blade up to 13 mm long.

5. Stenanthemum pumilum (F.Muell.) Diels *in* Diels & E. Pritzel, *Bot. Jahrb. Syst.* 35: 356 (1904). – *Spyridium pumilum* F. Muell., Fragm. Phyt. Austral. 9: 137 (1975). – *Cryptandra pumila* (F. Muell.) F. Muell., Syst. Census Aust. Pl. 61 (1882–1883). *Type:* Stirling Range, Western Australia, *F. Mueller* (*holo:* MEL *n.v.*).

Affinities. See notes under its closest relative *Stenanthemum yorkense* Rye.

Notes. Stenanthemum pumilum has two geographically separated variants described separately below. Differences between them are all quantitative rather than qualitative and so these two taxa are treated here as subspecies rather than distinct species.

5a. Stenanthemum pumilum (F.Muell.) Diels subsp. **pumilum**

Illustration: Rye (1995b: fig. 12 G,H).

Shrubs low and spreading, probably up to 0.1 m high but mostly 20–50 mm high, up to at least 0.15 m wide. *Young stems* with a very dense indumentum of appressed simple white hairs mostly 0.5–0.7 mm long. *Stipules* connate at base for *c.* half or most of their length, 2.5–3.5 mm long, papery and readily town, brown, long-ciliate at first, apex acuminate below a point 0.8–2 mm long; outer surface with long appressed simple hairs all or mainly along midrib; inner surface glabrous; point hairy, separated from the point of the other stipule by a sinus, which often has several small teeth or a longer central tooth. *Petioles* 1–1.5 mm long, densely hairy on both surfaces at first. *Leaf blades* conduplicate at first then opening at centre and sometimes at base but with the apex remaining pinched in, obovate, 4–7 × 1.4–2.5 mm, entire, with more or less flat margins, unpointed or sometimes with a narrow hairy apical point or an apical tuft of hairs up to 0.4 mm long; lower surface without any conspicuous lateral veins and with a very dense indumentum of appressed simple white hairs mostly 0.7–1.3 mm long at first, sometimes with a few ferruginous hairs, becoming less densely hairy and with 4–8 main lateral veins visible on each side of midvein; upper surface greyish, covered in minute simple patent hairs at first, becoming dark grey-green and almost glabrous but retaining at least some hairs along the midvein. *Flower clusters* few- or many-flowered, 6–10 mm diam. *Floral tube* 2–2.3 mm long, tapering towards the base; adnate part of tube glabrous at base, with antrorse simple hairs towards summit; free part *c.* 1.5 mm long, very densely hairy, with spreading simple white hairs that are not as curled as the hairs on the sepals, the longest ones *c.* 1.5 mm long. *Sepals* spreading at anthesis but fairly erect at other times, 1–1.2 mm long, very densely covered outside by irregularly curled widely spreading white hairs 0.5–0.8 mm long. *Petals* 0.5–0.6 mm long, the claw up to *c.* 0.25 mm long. *Disc* apparently absent. *Ovary* with summit glabrous. *Style* 1.6–2.2 mm long. *Fruit* 2–2.3 mm long, hairy at first, becoming glabrous. *Seeds* 1.5–1.6 mm long; body *c.* 1.4–1.5 × 0.8–0.9 mm, with a dark brown base and somewhat mottled pale and medium brown above; aril *c.* 0.7 mm long, pale ferruginous- or clear-translucent, 3-lobed, the central lobe much longer than the lateral lobes.

Selected specimens examined. WESTERN AUSTRALIA: Stirling Range *c.* 2 km from car park, 26 Sep. 1996, *B.A. Fuhrer* 96/26 (PERTH); Warrungup Hill, Stirling Range, 12 Oct. 1928, *C.A. Gardner* 2200 (PERTH); Stirling Range Scenic Drive, NE of Mondurup, 6 Sep. 1971, *A.S. George* 10918 (PERTH); 1.39 km N of West Pillenorup Track on Hostellers Track, 26 Jan. 1989, *R.T. Wills* 1253 (PERTH); Chester Pass, East Stirlings, 26 Sep. 1963, *E. Wittwer* 212 (PERTH).

Distribution and habitat. Endemic to the Stirling Range, in the South West Botanical Province of Western Australia, with two records from gravel, one record in rocky sandy soil in *Eucalyptus* high shrubland and one record from massive laterite. (Figure 6C)

Flowering period. Flowers early September to mid October. Seeds measured from *C.A. Gardner* 2200.

Conservation status. Conservation Codes for Western Australian Flora: Priority Three. This subspecies is endemic to the Stirling Range. Most collections were made before 1975 but the most recent collection was in 1996, and another collection was made in 1989 as part of a study (Wills 1993) into the ecological impact of *Phytophthora cinnamomi* in the Stirling Range. That paper made no mention of the Rhamnaceae but most Rhamnaceae appear from field observations not to be susceptible to the dieback fungal disease so presumably *S. pumilum* is not at risk.

5b. Stenanthemum pumilum subsp. **majus** Rye, *subsp. nov.*

Differt a subsp. *pumilum* foliis et floribus grandioribus.

Typus: c. 100 m SW of Metro Rd, 2.1 km S from Brookton Highway, Wandering Shire, Western Australia, 29 January 1999, *F. Hort* 407 (*holo:* PERTH 05377331; *iso:* CANB).

Illustration: Rye (1995b: fig. 12 I–K).

Shrubs low and spreading, probably up to 0.15 m high, mostly 30–120 mm high, width not or rarely recorded. *Young stems* with a very dense indumentum of appressed simple white hairs mostly 0.5–1 mm long. *Stipules* connate at base for *c.* half or most of their length, commonly 3–4 mm long, papery and readily town, apex acuminate below a point 1–1.5 mm long, brown, long-ciliate at first; outer surface with long appressed simple hairs all or mainly along midrib; inner surface glabrous; point hairy, separated from the point of the other stipule by a sinus, which often has several small teeth or a longer central tooth. *Petioles* 1.5–3 mm long, densely hairy on lower surface at first, glabrous to densely hairy on upper surface. *Leaf blades* conduplicate at first then opening at centre but with the base and apex remaining pinched in, obovate, (7.5)9–14 × 3–5 mm, entire, with incurved margins, unpointed or sometimes with an apical tuft of hairs or narrow hairy apical point up to 0.5 mm long; lower surface without any conspicuous lateral veins and with a very dense indumentum of appressed simple white hairs mostly 0.6–1 mm long at first, sometimes with a few ferruginous hairs, becoming less densely hairy and with 7–12 main lateral veins visible on each side of midvein; upper surface covered in minute simple patent hairs at first, becoming almost glabrous but retaining at least some hairs along the midvein, sometimes with a few larger simple hairs c. 0.3 mm long towards the base. *Flower clusters* usually many-flowered, mostly 8–10 mm diam. *Floral tube* 2.5–3.5 mm long, tapering towards the base; adnate parte often more or less glabrous at base; free part 1.8–2.6 mm long, very densely hairy with antrorse to spreading hairs that are somewhat or much less curled than those on sepals, the longest hairs up to *c.* 2 mm long. *Sepals* spreading at anthesis but fairly erect at other times, 1.1–1.3 mm long, with a very dense indumentum outside of irregularly curled widely spreading white hairs 0.6–1 mm long. *Petals* 0.6–0.7 mm long, narrowly clawed; claw 0.25–0.3 mm long. *Disc* apparently absent. *Ovary* with summit glabrous. *Style* 2.4–3 mm long. *Fruit* broadly obovoid to globular, 2.3–2.6 mm long, pale to medium brown for most of its length, darker brown towards the summit, with fine simple long hairs loosely attached, often becoming glabrous. *Seeds* 1.6–1.9 mm long; body 1.4–1.6 × 0.9–1.1 mm, with a dark or very dark brown base and mottled or spotted with pale and medium shades of brown above; aril 0.8–1.3 mm long, partly yellowish or pale ferruginous and partly clear-translucent, 3-lobed, the central lobe often far longer than the lateral lobes.

Selected specimens examined. WESTERN AUSTRALIA: 10 km S along Watershed Rd off Brookton Highway, 19 Nov. 1981, *R.J. Cranfield* 1971 (PERTH); 100 m W of Metro Rd, 19.5 km S from Brookton Highway, Wandering Shire, 21 Sep. 2001, *J. Kellermann* 315 *& F. Hort* (PERTH); Lupton Conservation Park, 1.1 km WNW along Perimeter Rd from the junction of East Rd, 7 Oct. 1997, *J.L. Robson s.n.* (PERTH); Moorapulling Nature Reserve No. 32448, 27 Nov. 1997, *J.L. Robson s.n.* (PERTH); Coleman Block, State Forest 52, E of Yarranabee Road, SW of Highbury, 19 Oct. 1999, *G. Warren, C. Taylor & P. Rose* 414 (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province of Western Australia, extending from near Brookton Highway on the Darling Range (east of Perth) south-east to near Highbury, usually in gravelly soils, often associated with laterite or granite sheets and outcrops, commonly with *Allocasuarina humilis* and a variety of eucalypt species. (Figure 6C)

Flowering period. Flowers mainly from mid September to early December. Mature fruits and seeds observed on *R.J. Cranfield* 1971, *J.L. Robson s.n.* 4 Dec. 1997 and *J.L. Robson s.n.* 15 Oct. 1997.

Conservation status. This taxon is known from more than 15 populations over a range *c.* 125 km long and does not appear to be under any immediate threat.

Etymology. Named from the Latin word *majus* (greater), referring to the larger size of the leaves, flowers and often also the larger habit of this subspecies.

Notes. The distance separating the known ranges of this subspecies and *Stenanthemum pumilum* subsp. *pumilum* is over 150 km. The new taxon differs in being larger in many of its vegetative and floral characters, including its floral tube and style, and possibly tends to have a larger seed. It also tends to be a larger plant.

6. Stenanthemum radiatum Rye, *sp. nov.*

Stenanthemo cristato simile sed foliis supra glabratis, foliis longioribus et inflorescentiis grandioribus differt.

Typus: Burma Road Nature Reserve [precise locality withheld], Western Australia, 23 Oct. 1998, *G.J. Keighery & N. Gibson* 2904 (*holo:* PERTH 05784158).

Shrubs spreading, 0.1–0.3 m high. *Young stems* often leafless except for the leaves surrounding each inflorescence, with a rather sparse indumentum at first of small white stellate hairs but no simple hairs, becoming glabrous. *Stipules* connate at the base, those surrounding the inflorescence connate for most of their length, 2–3 mm long, broad, densely hairy along midvein outside and sparsely hairy laterally, golden-brown. *Petioles* 1–2 mm long, densely hairy on undersurface, glabrous on upper surface. *Leaf blades* narrowly triangular to cordate, 8–14 × 3–5 mm, mostly with 2 large lobes (the apex emarginate), often also with a central apical tooth between the lobes, sometimes with 2–4 teeth across a more truncate summit, margins strongly recurved; lower surface with a white or partially ferruginous dense indumentum of stellate hairs and larger simple antrorse or appressed hairs, the simple hairs up to *c.* 1 mm long; upper surface with minute broad protrusions, green. *Flowers* densely crowded in a terminal head-like cluster 5–8 mm diam., white, surrounded by several or a circle of spreading leaves that give the whole inflorescence a somewhat daisy-like appearance. *Floral tube c.* 1 mm long (enlarging to *c.* 2 mm in fruit), very densely hairy, the free part longer than adnate part but shorter than the sepals; largest hairs simple, antrorse, 0.8–1.2 mm long. *Sepals c.* 1 mm long, very densely hairy, the long simple hairs extending *c.* 0.5 mm beyond the apex. *Petals c.* 0.6 mm long; claw 0.2–0.3 mm long. *Disc* lining floral tube, scooped between the stamens. *Ovary* 3-locular; summit with a few stellate hairs *c.* 0.3 mm long. *Style* 0.6–0.8 mm long. *Fruit* 1.8–2 mm long, densely hairy. *Seeds c.* 1.3 mm long; body *c.* 1 × 0.6–0.8 mm, off-white with a black base and a few small dark brown markings on lateral surfaces; aril 0.6–0.8 mm long, clear-translucent, with most of its length derived from its very large central (adaxial) tooth-shaped lobe, the lateral lobes also tooth-like but short.

Other specimens examined. WESTERN AUSTRALIA: Burma Road Nature Reserve, [precise locality withheld], 7 Nov. 2005, *A. Franks, S. Branigan & B. Smith* 213 (AD, PERTH); Burma Road Nature Reserve, [precise locality withheld], 22 Sep. 1997, *S.J. Patrick* 2981 (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province of Western Australia. Known only from Burma Road Nature Reserve, which is between Geraldton and Mingenew in the area east of Walkaway. Recorded in grey sand over laterite in vegetation with *Calothamnus*, *Hakea* and *Allocasuarina*. (Figure 6C)

Flowering period. September to November.

Conservation status. Conservation Codes for Western Australian Flora: Priority Two. Currently known from a single population in a nature reserve, where it is recorded as being common.

Etymology. The name comes from the Latin *radiatus* (with spokes, radiating), as this species has leaves closely subtending the inflorescence and radiating out from the central dense cluster of flowers.

Affinities. The closest relative of this species appears to be *Stenanthemum cristatum* Rye, a species occurring on the south coast *c.* 700 km away from the only known locality of *S. radiatum*. Both species are rare, perhaps being the last remnants of a group that was once widespread in the south-west. The new species has larger leaves and inflorescences than *S. cristatum* and the flower heads have a more fluffy appearance. It also has the upper leaf surface glabrous whereas *S. cristatum* has more or less patent simple hairs on the upper leaf surface. From the little available fruiting material of the two taxa it appears that *S. cristatum* has larger fruits and seeds with a more extensively mottled testa, but these differences need confirmation.

Another possible close relative is *Stenanthemum intricatum* Rye, which has similar seed colouring and a similar long aril but lacks the prominent tuft of hairs on its sepals.

Notes. This species was previously known as *Stenanthemum* sp. Burma Road (*G.J. Keighery & N. Gibson* 2904). In the first two collections of *Stenanthemum radiatum*, the stems are bare except for the groups of leaves closely surrounding each inflorescence or infructescence but a recently collected specimen also has scattered leaves up the stems. Stipules on the leaves directly surrounding the inflorescences are more or less fully connate and resemble a single structure with 2 slight rounded lobes at the apex. One of the leaves appears to be conduplicate because of the way it was pressed but the others are all fairly open. Probably the immature leaves would be conduplicate, but more material needs to be collected to check this.

7. Stenanthemum yorkense Rye *sp. nov.*

Stenanthemo pumilo arcte affine sed pilis in caule brevioribus, foliis longioribus planioribus, stipularum paribus et bracteis involucri cum apicus acuminatus latioribus, et floribus longioribus differt.

Typus: York area [precise locality withheld], Western Australia, 4 July 2005, *A. Sole & H. Green* KB22 (*holo:* PERTH 07350457; *iso:* MEL).

Shrubs low and spreading, commonly 0.1–0.15 m high and 0.2–0.25 m wide. *Young stems* with a dense indumentum of appressed or antrorse simple whitish hairs mostly 0.2–0.3 mm long. *Stipules*

connate at base for *c.* half or most of their length, 5–6 mm long, long-acuminate, brown; outer surface with a few appressed simple hairs especially along midrib; inner surface glabrous; acuminate points broad, meeting at the base. *Petioles* 3–4 mm long, densely hairy. *Leaf blades* conduplicate at first but opening fully, obovate to very broadly obovate, 8–17 × 4–8 mm, entire, with more or less flat margins, mostly with a slight apical point 0.2–0.3 mm long; lower surface with 5–8 main lateral veins on each side of midvein, with appressed simple white hairs mostly *c.* 0.5 mm long, sometimes with some ferruginous hairs along the main veins; upper surface bright green, smooth or minutely patterned, glabrous throughout or sometimes with a few short simple hairs along the midvein. *Flower clusters* few- or many-flowered, the larger ones 10–14 mm diam. *Flowers* white with a yellow centre. *Floral tube* 3.5–4.5 mm long, tapering towards the base; adnate part of tube tending to shed its hairs; free part *c.* 3 mm long, very densely hairy, with spreading simple curled hairs, the longest ones *c.* 1 mm long. *Sepals* fairly erect or spreading, *c.* 1.3 mm long, very densely covered outside by curled white hairs 0.6–0.7 mm long. *Petals c.* 0.6 mm long, distinctly clawed. *Disc* apparently absent. *Ovary* with summit glabrous. *Style c.* 3.8 mm long. *Fruit* globular, *c.* 2.x mm long, with loose long hairs, tending to become glabrous. *Seeds c.* 1.6 mm long; body *c.* 1.5 × 1 mm, with a black base and distinctly mottled with three shades of brown above; aril *c.* 0.7 mm long, white-translucent, 3-lobed, the central lobe much longer than the lateral lobes.

Other specimen examined. WESTERN AUSTRALIA: York area [precise locality withheld], , 13 Nov. 2004, *A. Sole & H. Green* KB64 (PERTH).

Distribution and habitat. Endemic to the South West Botanical Province of Western Australia, known from a single collection in the York area, from a quartzite hilltop, with *Eucalyptus accedens* and *Allocasuarina.* (Figure 6C)

Flowering period. Unknown. This species was collected with mature fruits in early July.

Conservation status. Conservation Codes for Western Australian Flora: Priority One. This very poorly known species appears to be restricted to a single hill or small range of hills on private land and is currently known from one large population.

Etymology. Named after the town of York, which is the closest large settlement to the only known population of this species.

Affinities. The closest relative of this species is *Stenanthemum pumilum*, a species with similar inflorescences, sepal indumentum and seeds. There are also many differences between the two species, as *S. yorkense* has a more open habit, stipules with broader closer acuminate points (*cf.* Rye 1995: fig. 12H of the stipules of subsp. *pumilum* with their more filiform and widely spaced points), larger leaves with the bright green upper surface opening fully, and longer flowers with a longer style. All vegetative parts tend to be less hairy, for example the hairs on the young stems are shorter and more discrete in the new species. *Stenanthemum yorkense* is also geographically separated from *S. pumilum*, occurring more than 50 km north-eastwards from the range of *S. pumilum* subsp. *majus*.

Notes. The type collection has mature fruiting inflorescences with most of the seeds already shed. Only one mature seed was measured. In fruit the sepal hairs are reduced in length to 0.3–0.4 mm.

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References

Beard, J.S. (1980). A new phytogeographic map of Western Australia. *Western Australian Herbarium Research Notes* 3: 37–58.

Bentham, G. (1863). "Flora Australiensis." Vol. 1. (Reeve & Co.: London.)

Diels, L. & Pritzel, E. (1904). Rhamnaceae. *In:* Fragmenta Phytographiae Australiae occidentalis. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 35: 349–357.

Endlicher, S.F.L., Fenzl, E., Bentham, G. & Schott, H.W. (1837). "Enumeratio Plantarum." (F. Beck: Wein.)

Gardner, C.A. (1942). Contributiones florae Australiae occidentalis. XI. *Journal of the Royal Society of Western Australia* 27: 165–210.

Kellermann, J., Udovicic, F. & Ladiges, P.Y. (2005). Phylogenetic analysis and generic limits of the tribe Pomaderreae (Rhamnaceae) using internal transcribed spacer DNA sequences. *Taxon* 54: 619–631.

Kellermann, J., Rye, B.L. & Thiele, K.R. (2006). *Polianthion*, a new genus of Rhamnaceae from Western Australia and Queensland. *Australian Systematic Botany* (in press).

Kellermann, J., Rye, B.L. & Thiele, K.R. (2007). *Blackallia*, *Papistylus* and *Serichonus*: three closely related genera of Rhamnaceae (Pomaderreae). *Nuytsia* 16: 299–316.

Richardson, J.E., Fay, M.F., Cronk, Q.C.B. & Chase, M.W. (2000). A revision of the tribal classification of Rhamnaceae. *Kew Bulletin* 55: 311–340.

Rye, B.L. (1995a). New and priority taxa in the genera *Spyridium* and *Trymalium* (Rhamnaceae) of Western Australia. *Nuytsia* 10: 119–140.

Rye, B.L. (1995b). New and priority taxa in the genera *Cryptandra* and *Stenanthemum* (Rhamnaceae) of Western Australia. *Nuytsia* 10: 255–305.

Rye, B.L. (1996). *Granitites*, a new genus of Rhamnaceae from the south-west of Western Australia. *Nuytsia* 10: 451–457.

Rye, B.L. (1997). The Rhamnaceae of the Kimberley Region of Western Australia. *Nuytsia* 11: 287–292.

Rye, B.L. (2001). An taxonomic update of Stenanthemum (Rhamnaceae: Pomaderreae), in Western Australia. *Nuytsia* 13: 495–507.

Rye, B.L. (2006). New combinations and lectotypifications for the south-western Australian genus *Astartea* (Myrtaceae). *Nuytsia* 16(1): 149–156.

Rye, B.L. & Trudgen, M.E. (1995). *Cryptandra monticola* (Rhamnaceae), a new species from the Pilbara Region of Western Australia. *Nuytsia* 10: 307–310.

Thiele, K.R. (2007). Two new species of Australian *Stenanthemum* (Rhamnaceae), with a conspectus and key to species outside Western Australia. *Journal of the Adelaide Botanic Gardens* 21: 63–70.

Tomlinson, P.B. (1978). Some qualitative and quantitative apects of New Zealand divaricating shrubs. *New Zealand Journal of Botany* 16: 299–309.

Western Australian Herbarium (1998–). FloraBase – the Western Australian flora. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/

Wills, R. (1993). The ecological impact of *Phytophthora cinnamomi* in the Stirling Range National Park, Western Australia. *Australian Journal of Ecology* 18: 145–159.